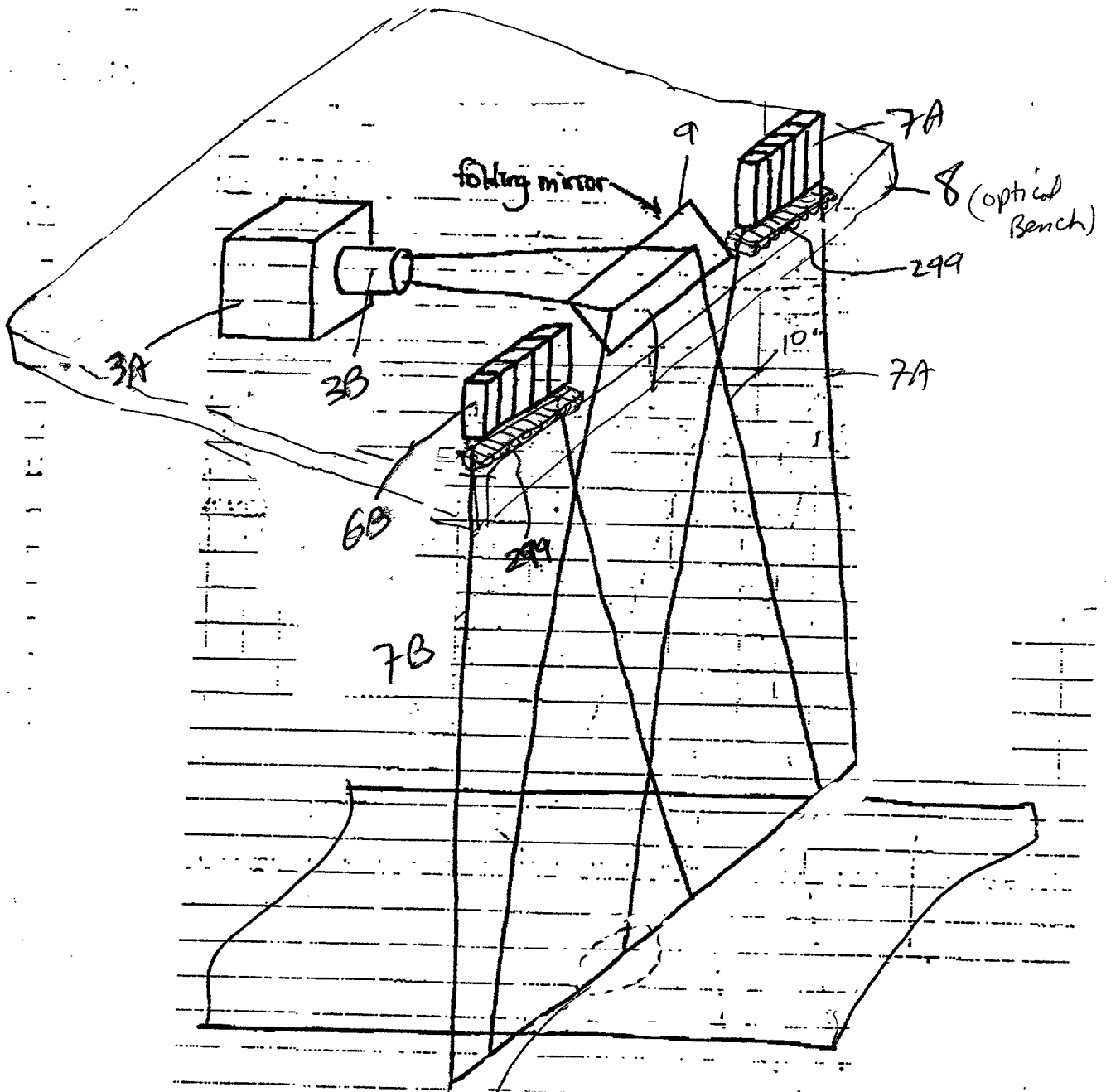


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JOHN D. HARRIS, JR., PRO.

10/067140





↑
1A

FIG. 1B1

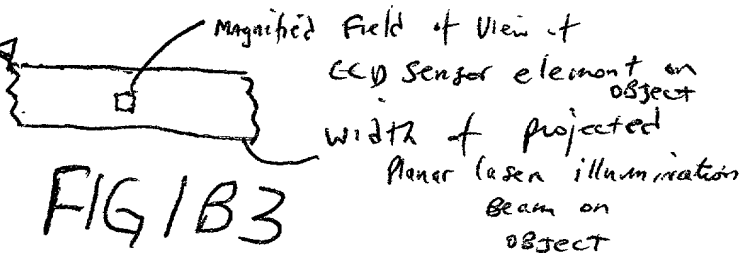


FIG. 1B3

FIG. 1B2

- (1) Fixed focal length camera lens
- (2) Fixed fixed distance

Linear (1D) detector array

Module housing

Planar laser illumination beam undergoes micro-movement

XIS

1A

3B

9

3/332

6A

299

7A

10

4

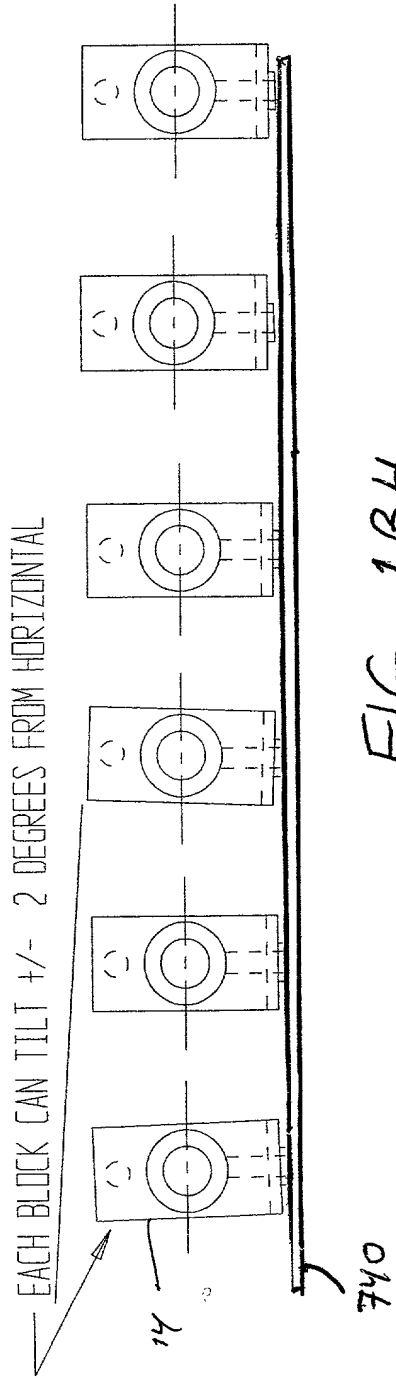
FIG. 1B2

11A 11C 11F

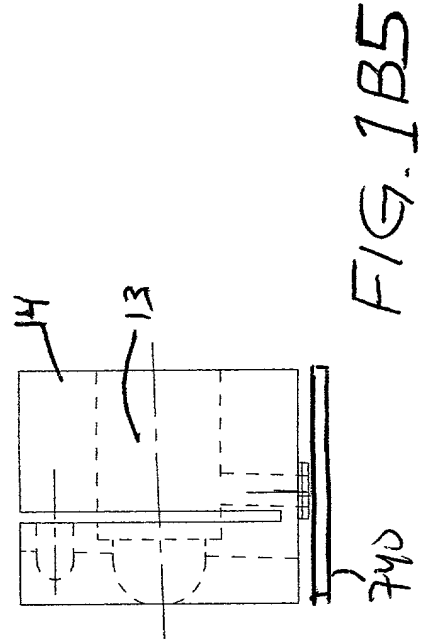
6B

7B

299



VLD BLOCK CAN PITCH FORWARD FOR ALIGNMENT WITH OTHER VLD BEAMS



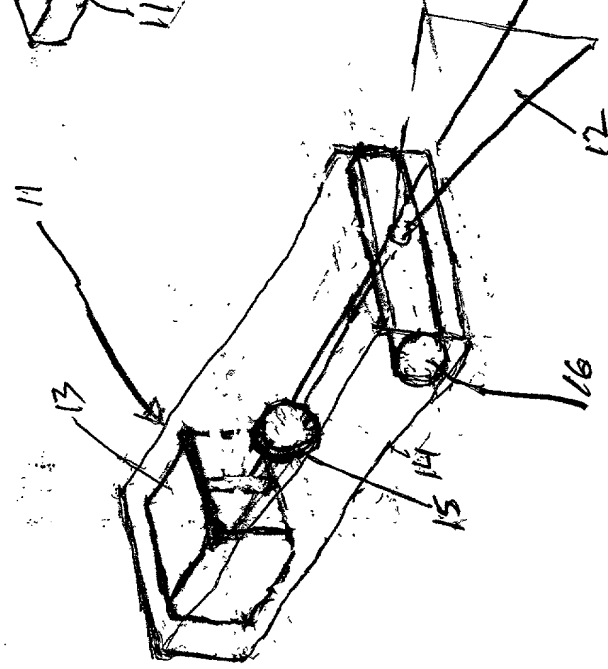


FIG. 1D



FIG. 1C

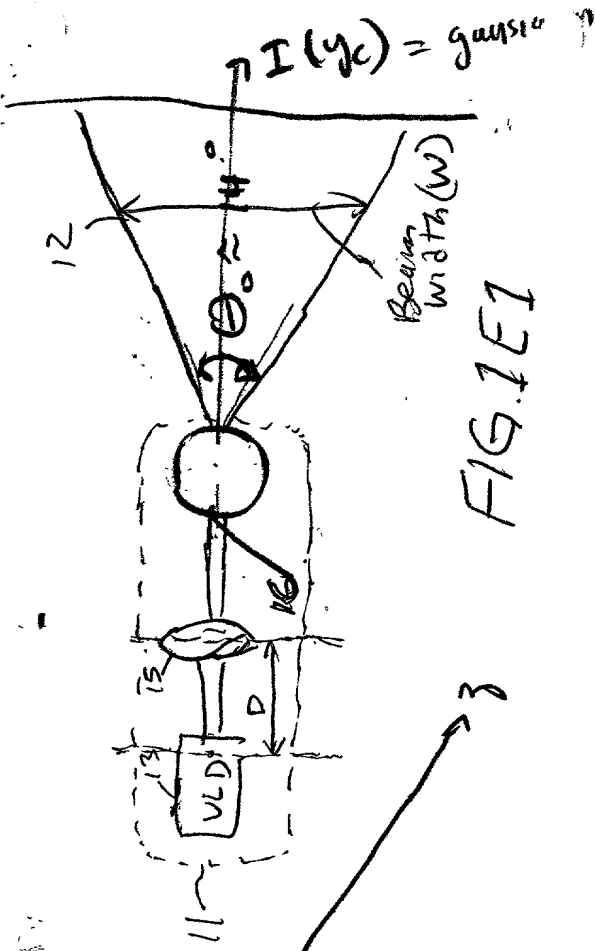


FIG. 1E1

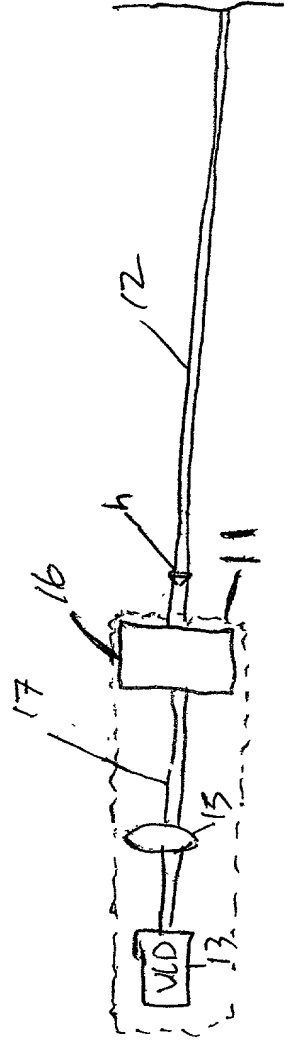
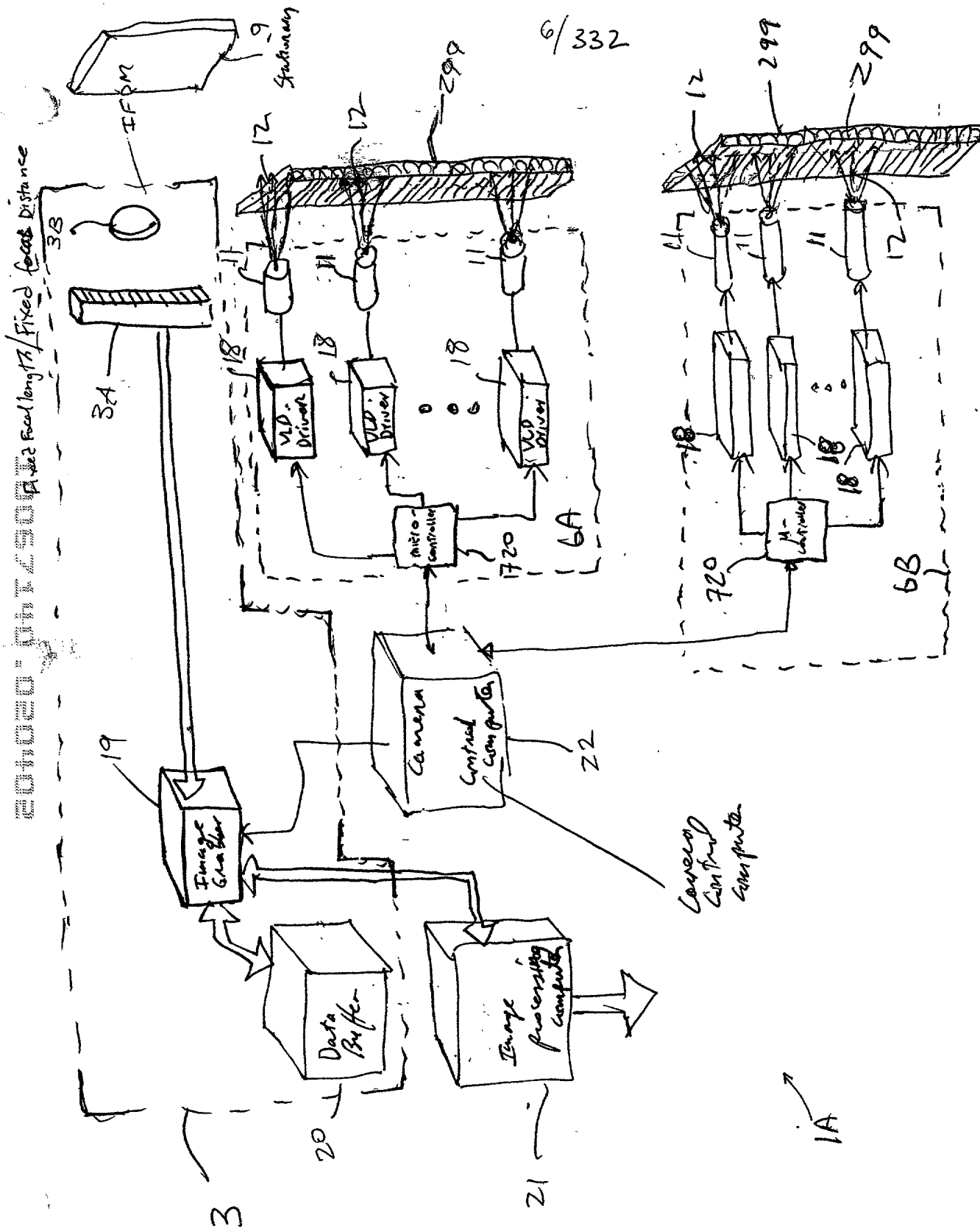
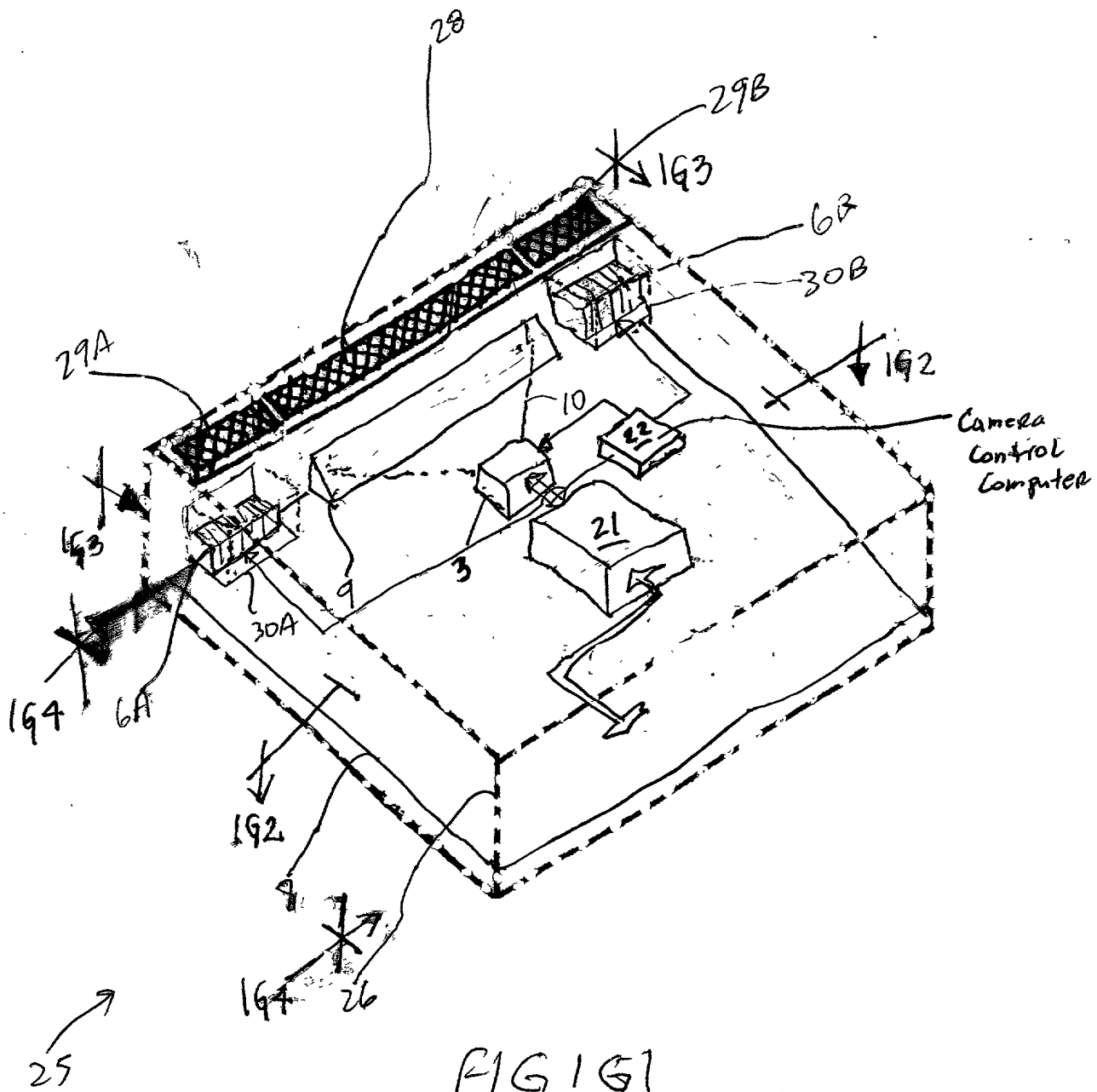


FIG. 1E2

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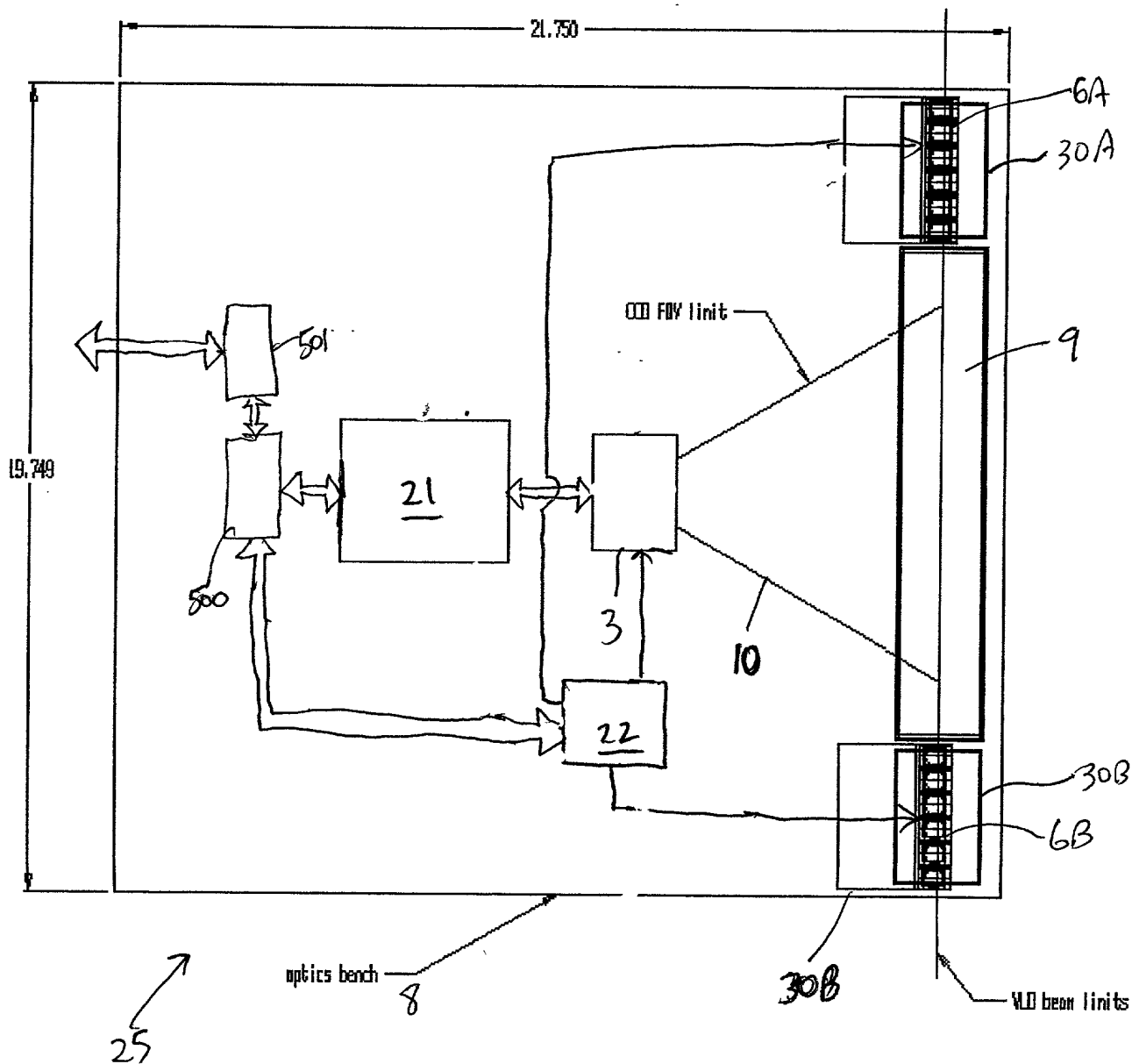


FIG. 1G2

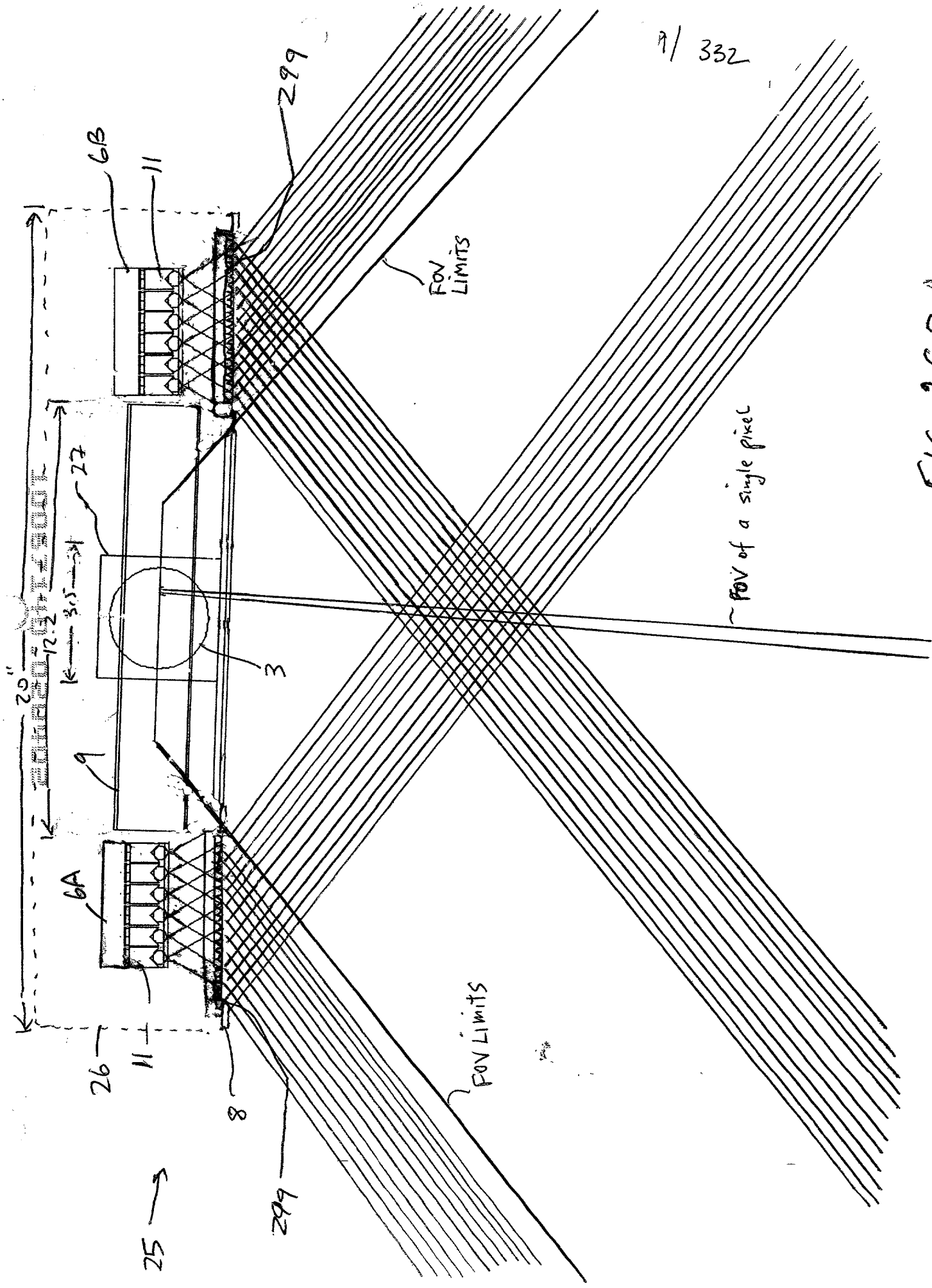


FIG. 193.

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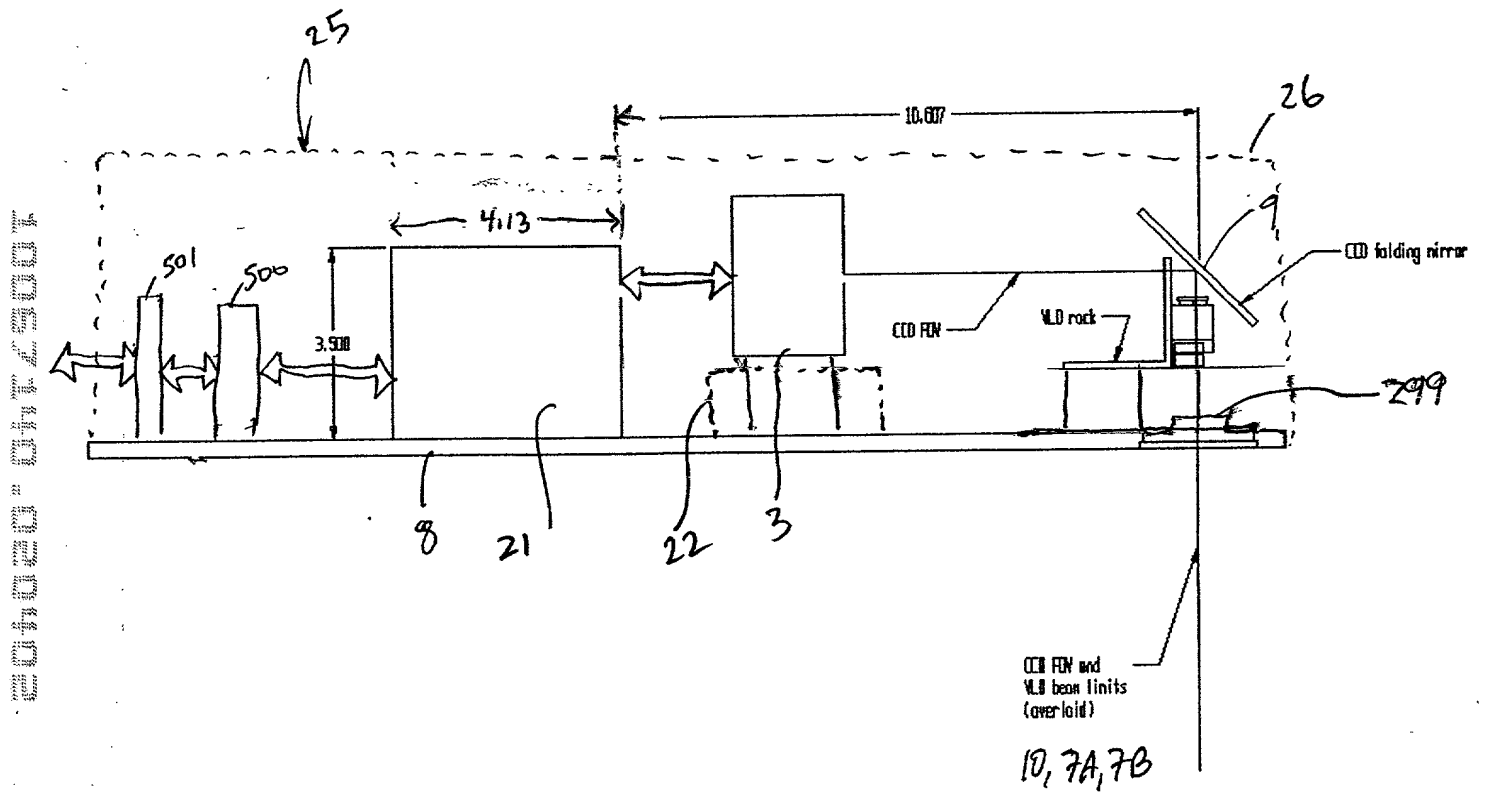
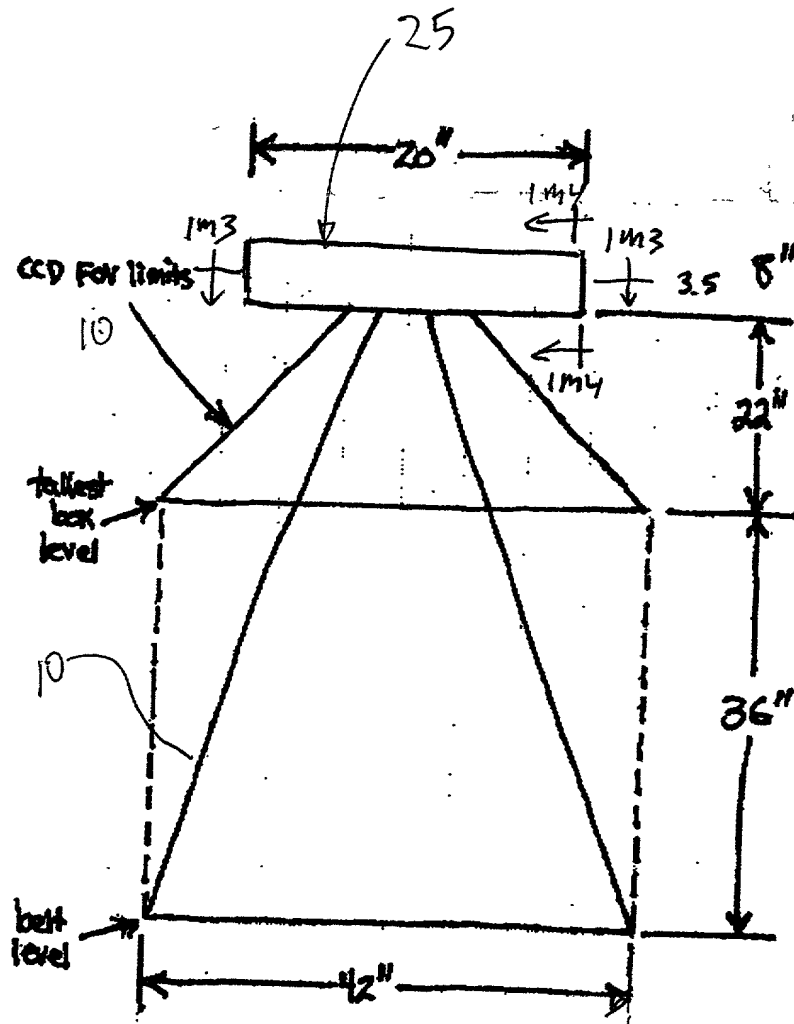


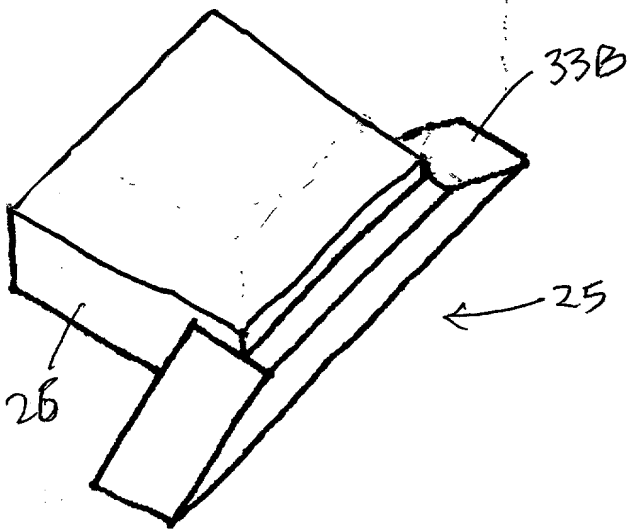
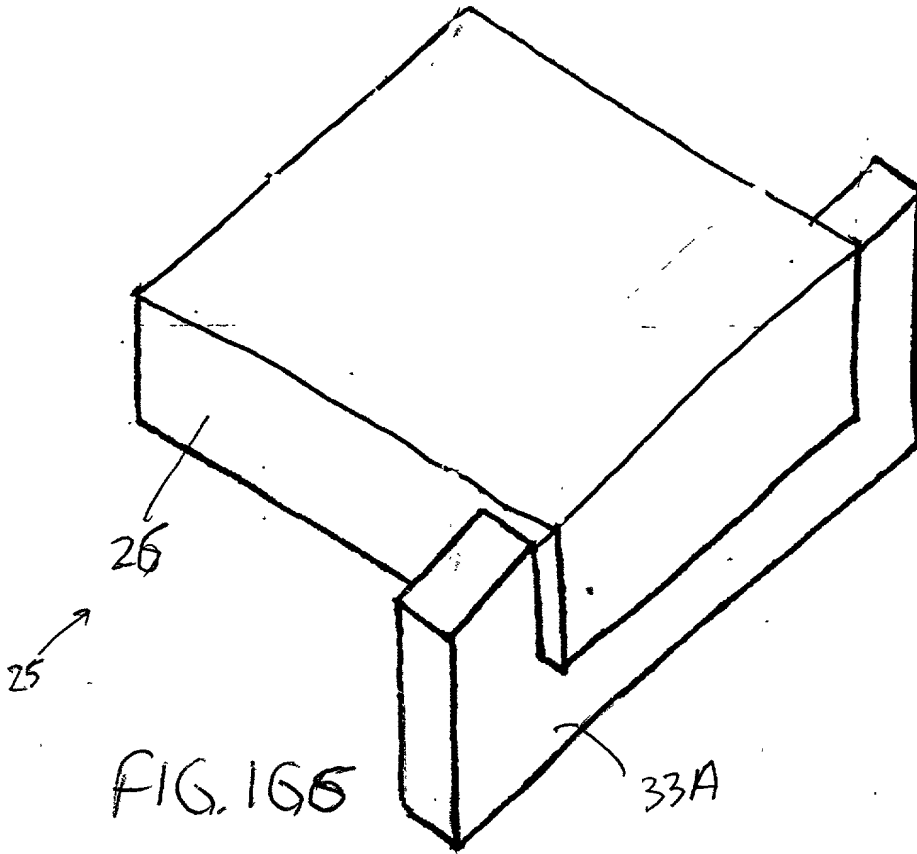
FIG. 164

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* Fixed Field of Field

FIG. 1G5



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6A, 6B

32A

32B

FIG. 1G 8

14 L bracket 14B

VLD sticking out of block

14 block

cylindrical lens 16

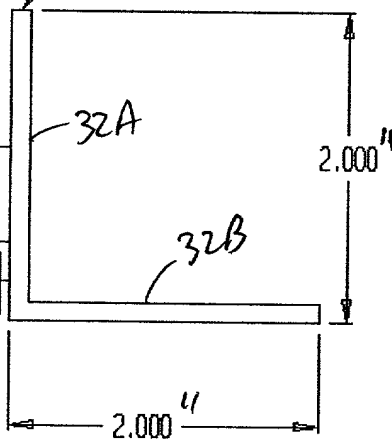


FIG. 1G.9

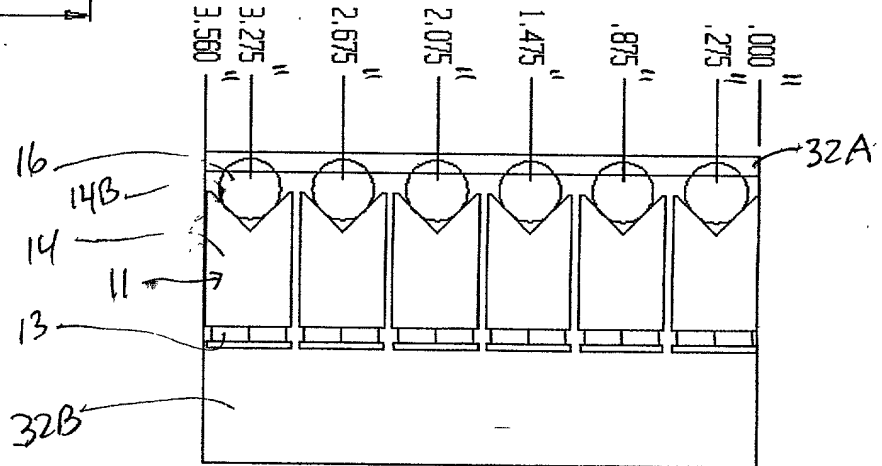


FIG. 1G 10

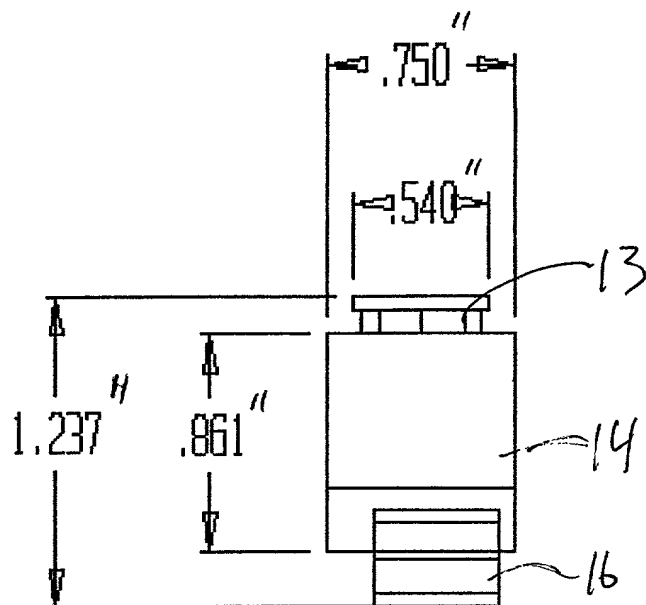


FIG. 1611

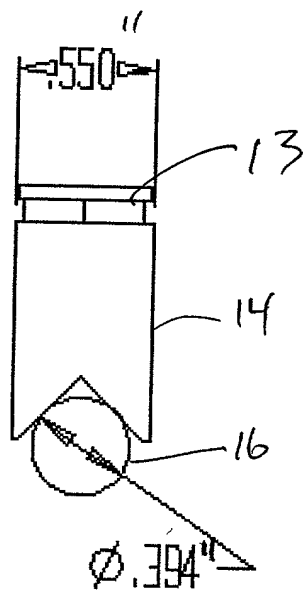
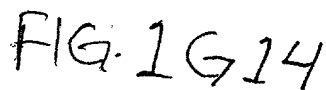
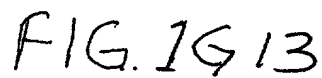


FIG. 1612

THE UNIVERSITY OF CHICAGO



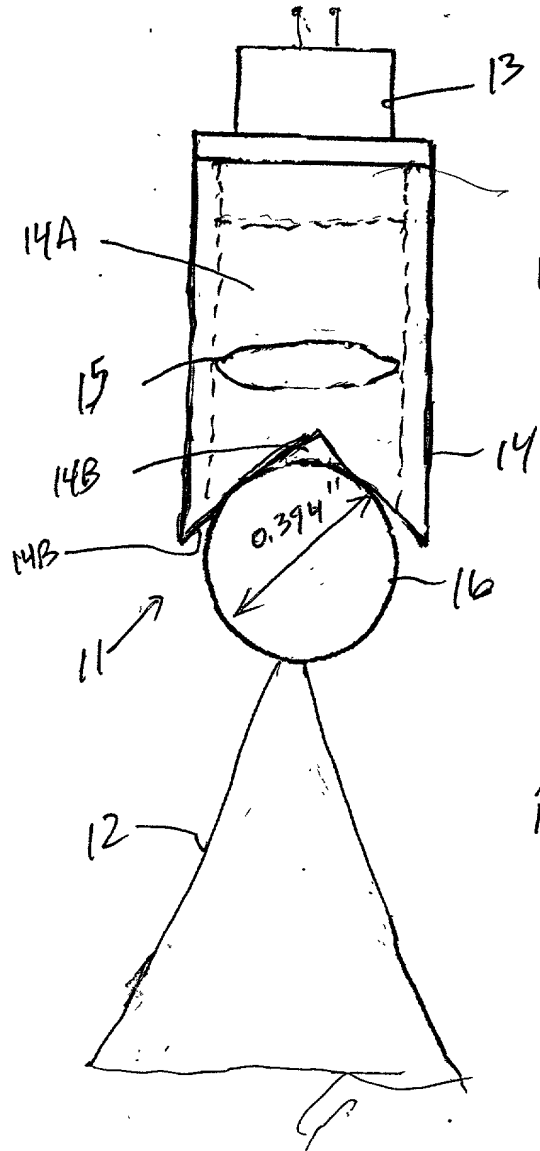


FIG. 1G15A

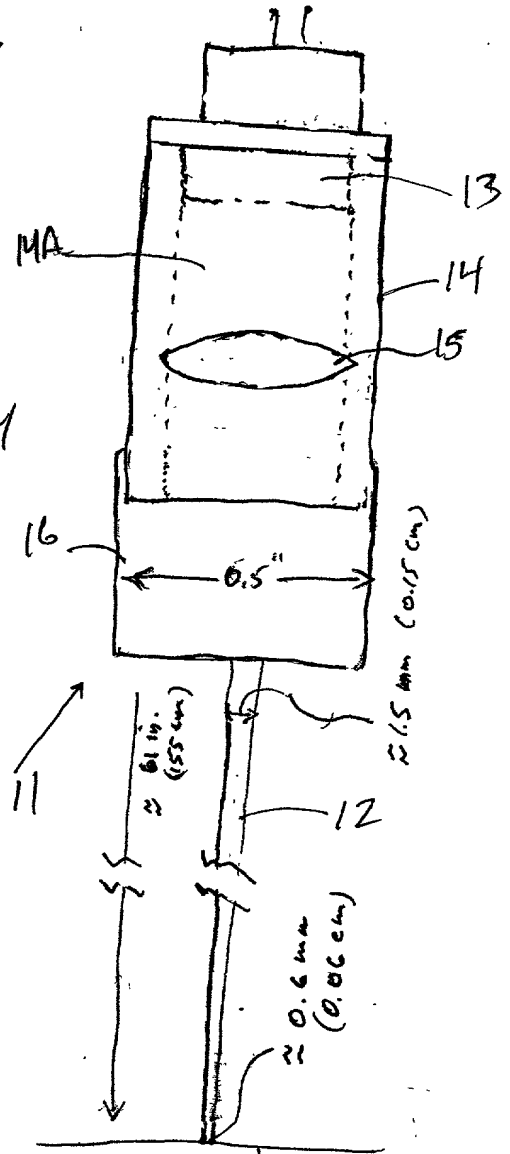


FIG. 1G15B
furthest object/working distance

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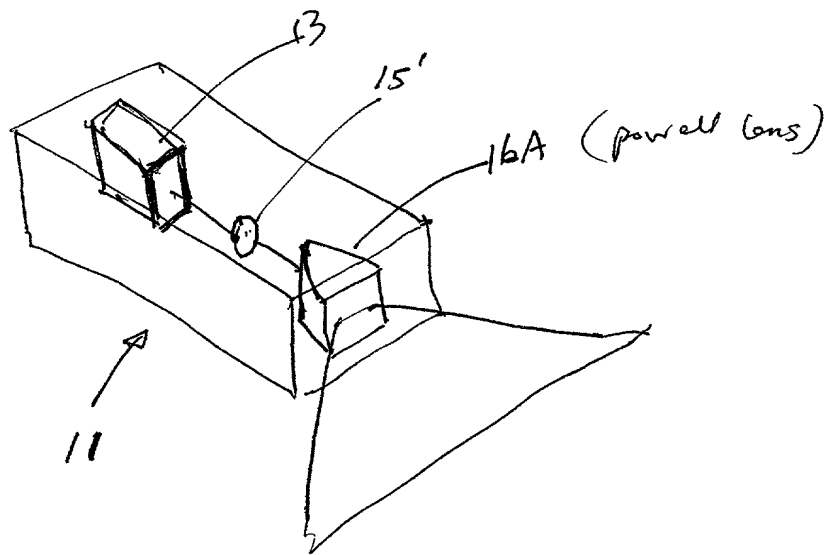


FIG. 1G.16A

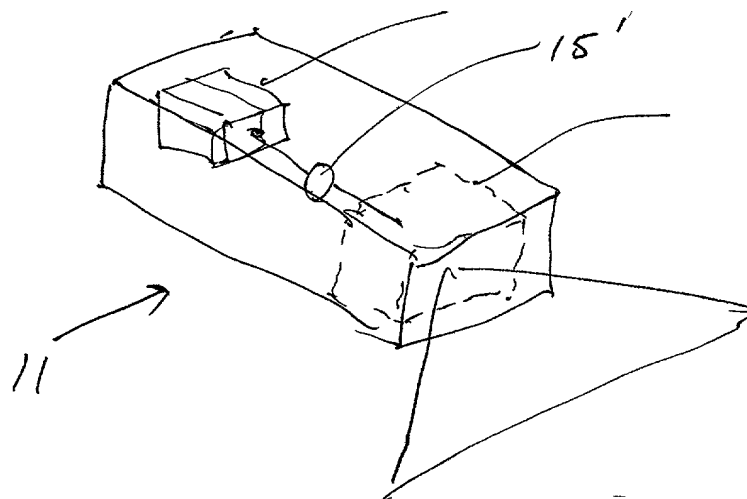


FIG. 1G.16B

PLIM w/
powell lens

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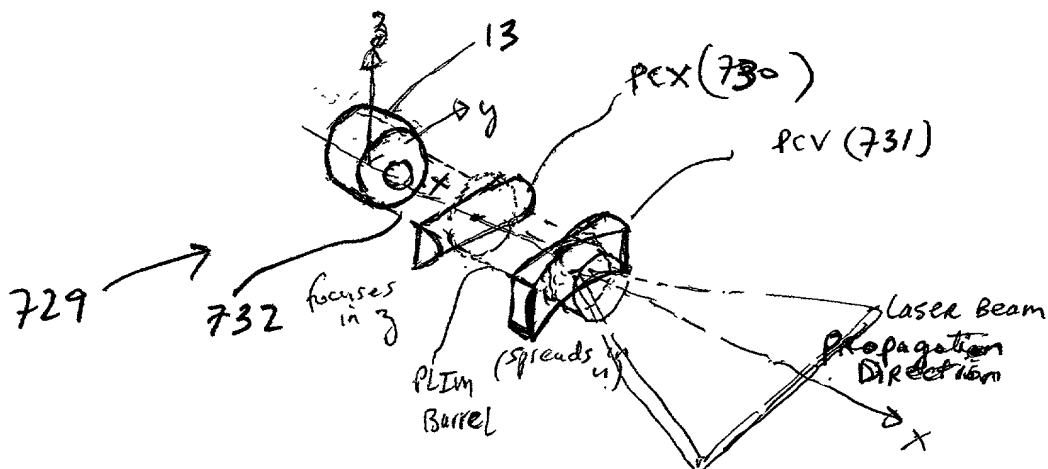


FIG. 16.17A

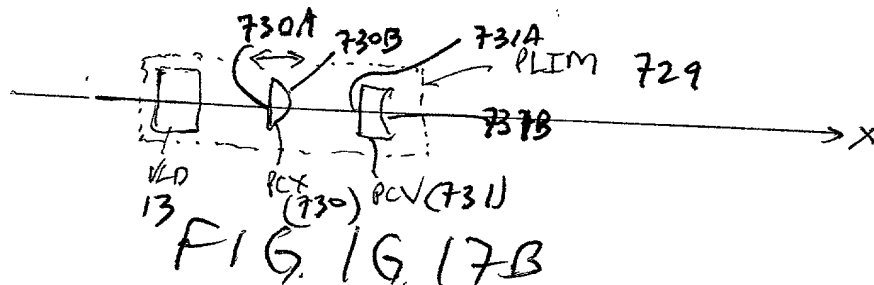


FIG. 16.17B

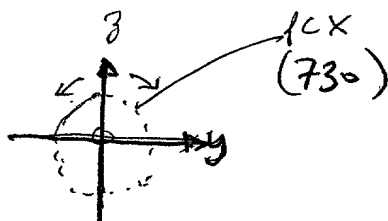


FIG. 16.17C

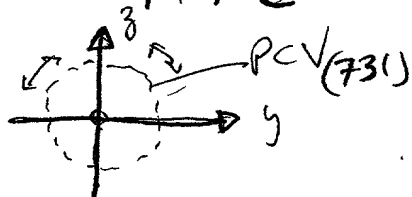


FIG. 16.17D

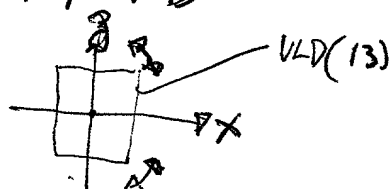


FIG. 16.17E

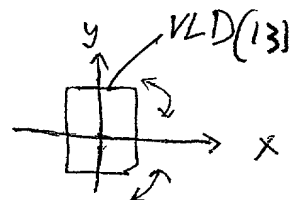


FIG. 16.17F

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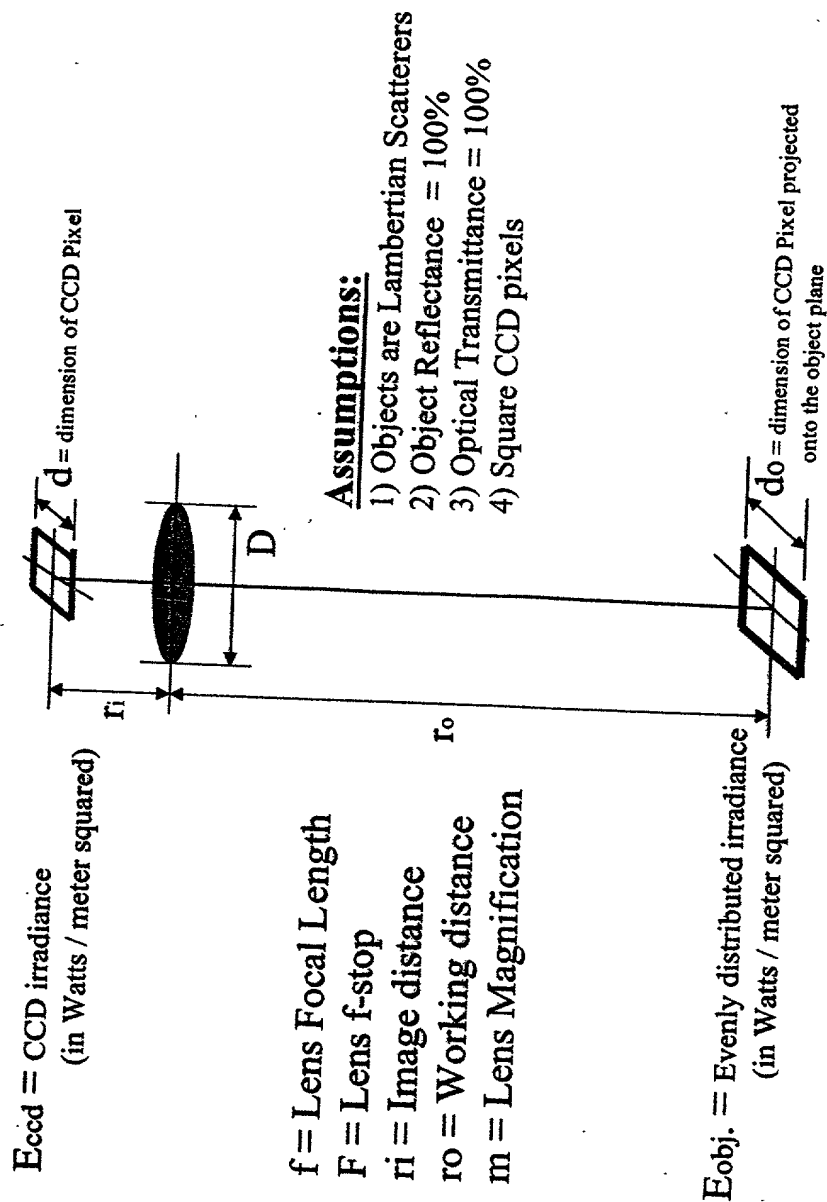


FIG. 1H6

FIRST GENERALIZED METHOD
of Reducing Speckle-Noise
PATTERNS AT IMAGE
DETECTION array OF THE
SPM SYSTEM (3)

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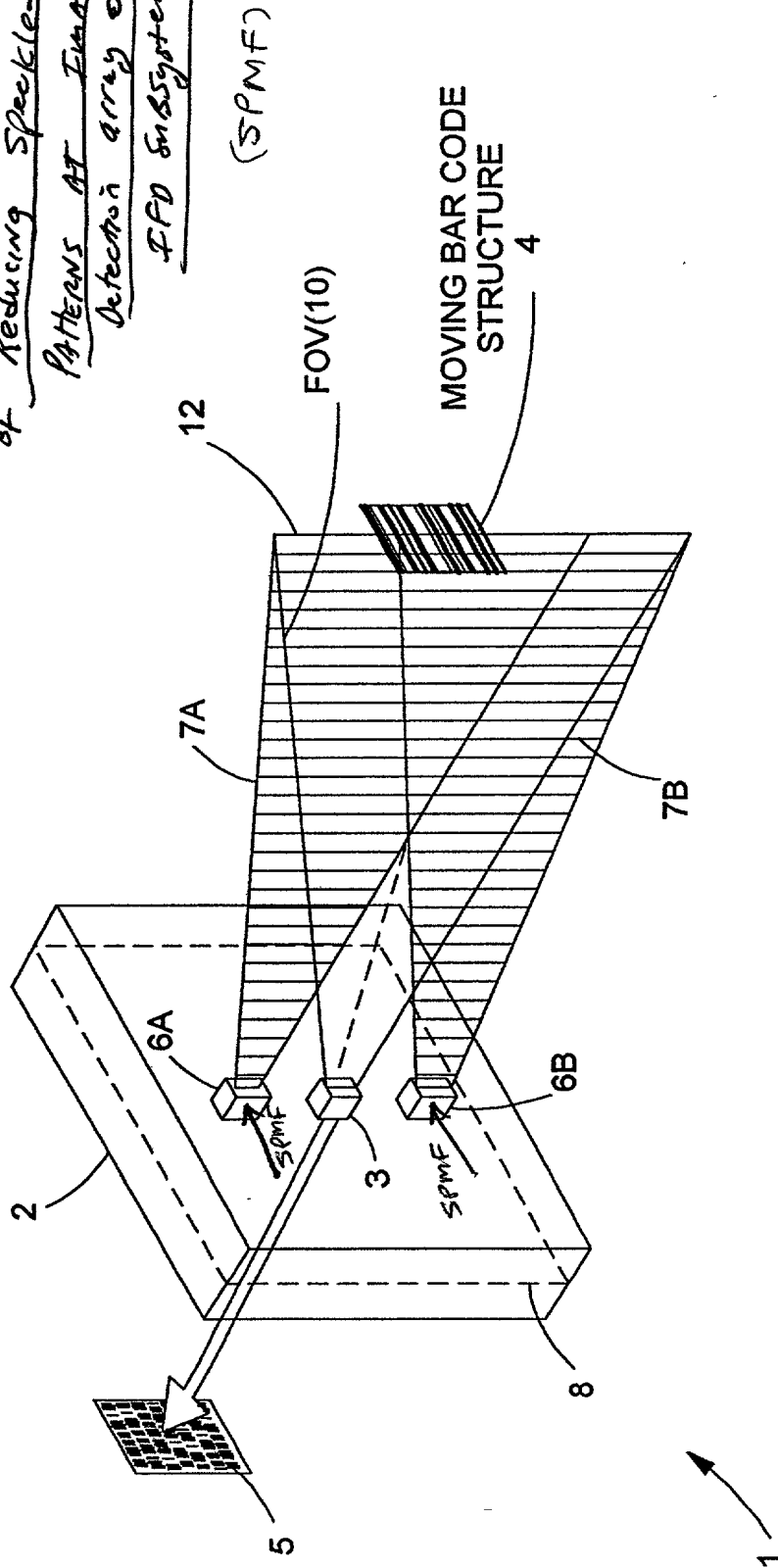
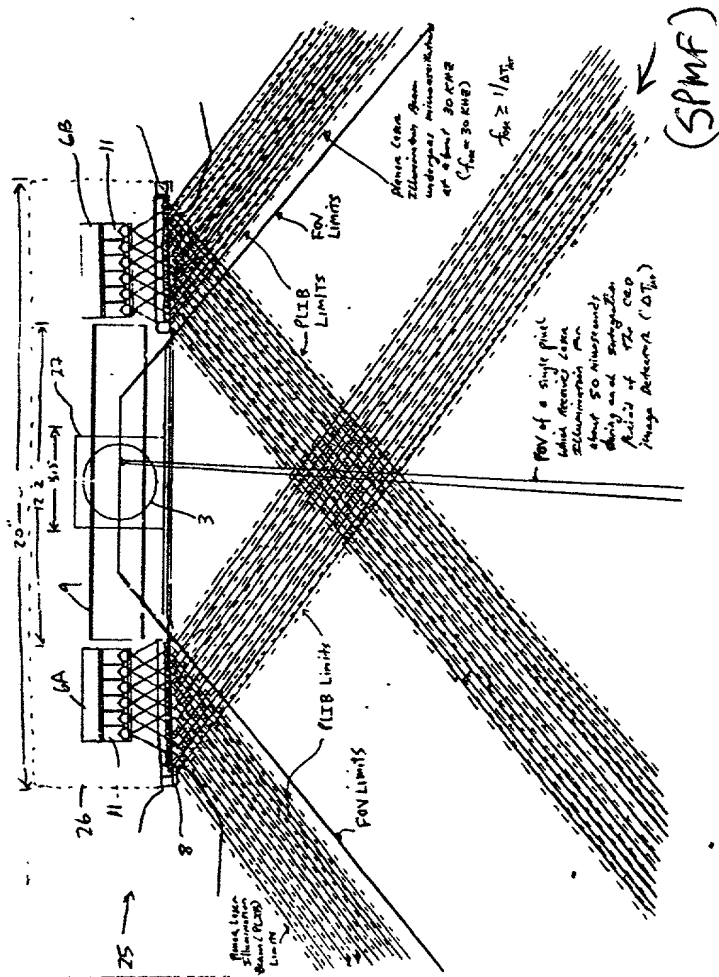


FIG. 1I1

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Prior to object illumination

FIG. 1I2A

The First Generalized Speckle-Noise Pattern Reduction Method
Of The Present Invention

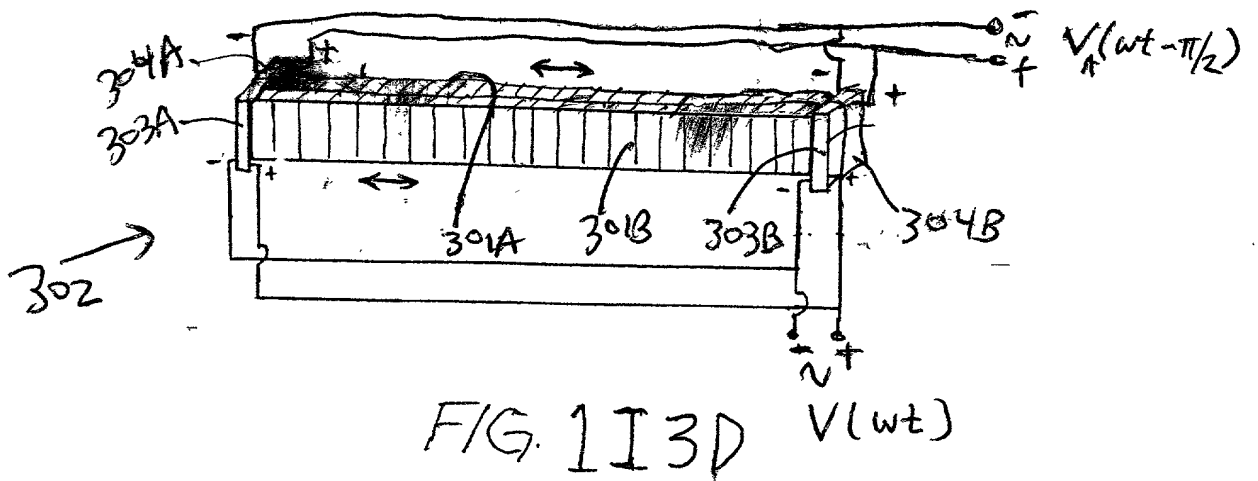
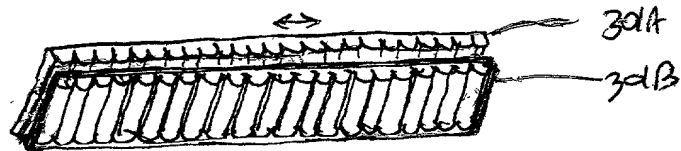
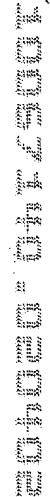
Prior to illumination of the target with the planar laser illumination beam (PLIB), modulate the spatial phase of the transmitted PLIB along the planar extent thereof according to a spatial phase modulation function (SPMF) so as to

produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

Temporally average the numerous substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce the power of the speckle-noise pattern observed at the image detection array.

FIG. 1I2B

?



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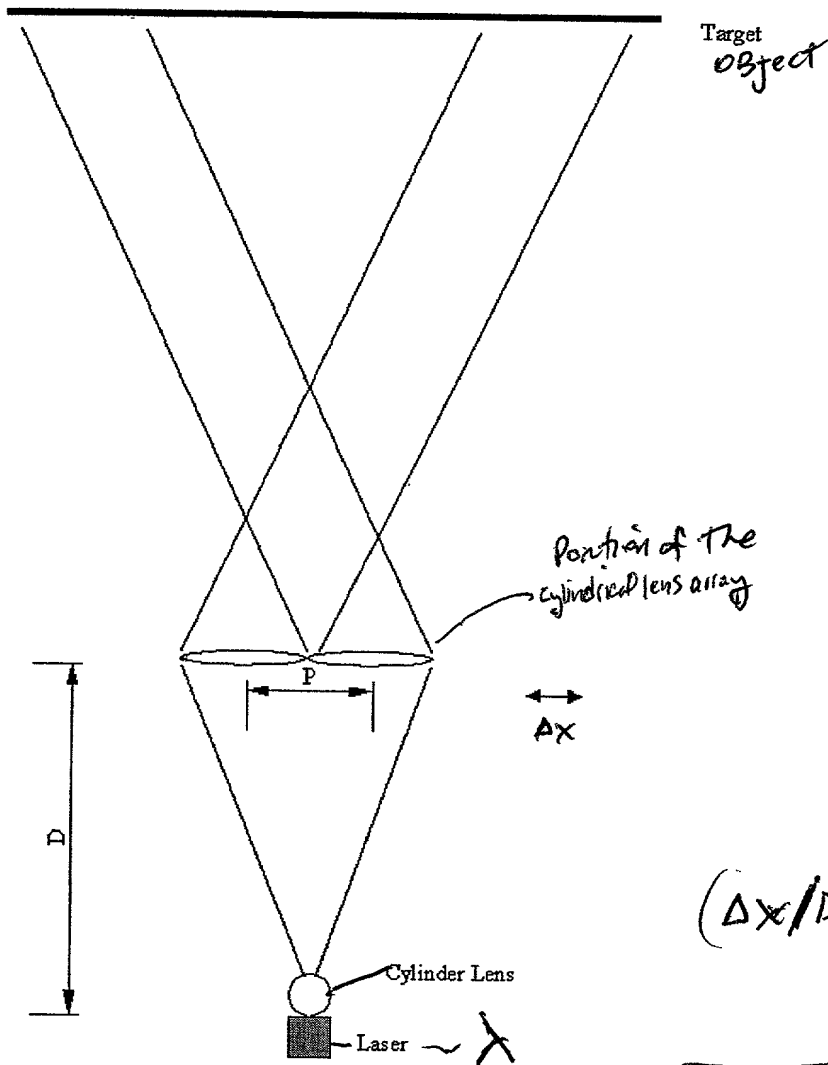


Figure 1

$$(\Delta x / D) P = \lambda$$

$$\Delta x \geq \frac{\lambda \cdot D}{P}$$

FIG. 1I3E

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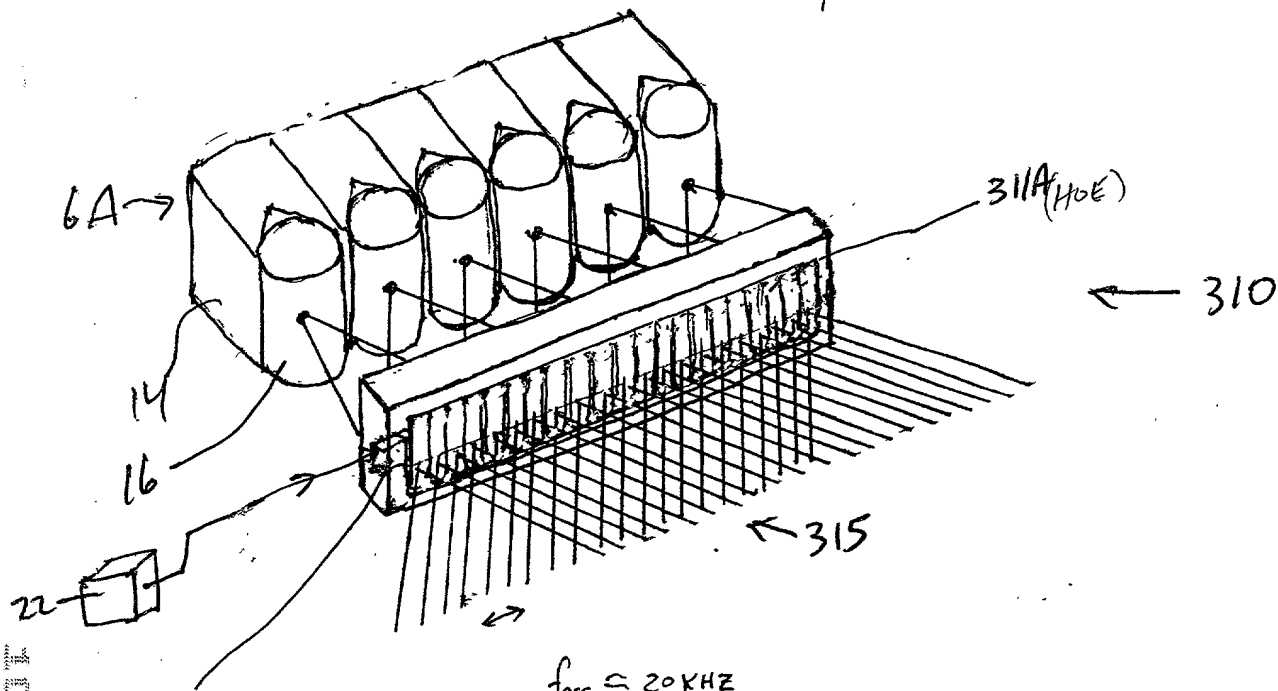


FIG. 1I3F



FIG 1I3G

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$f_{osc} \approx 20 \text{ KHZ}$

FIG 1I4A

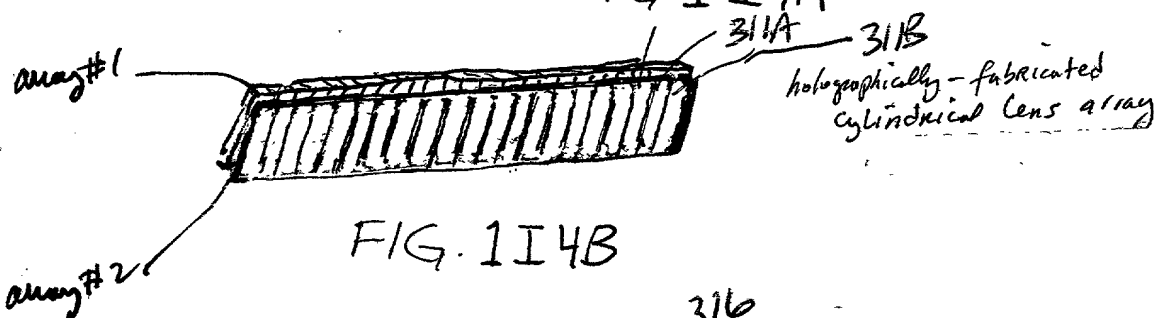


FIG. 1I4B

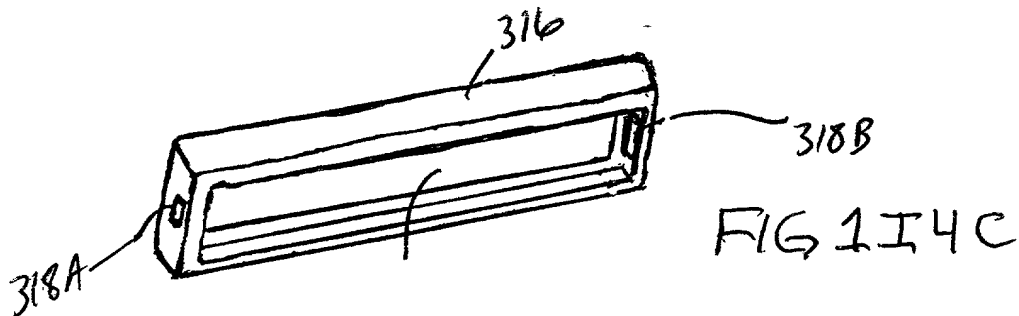


FIG 1I4C

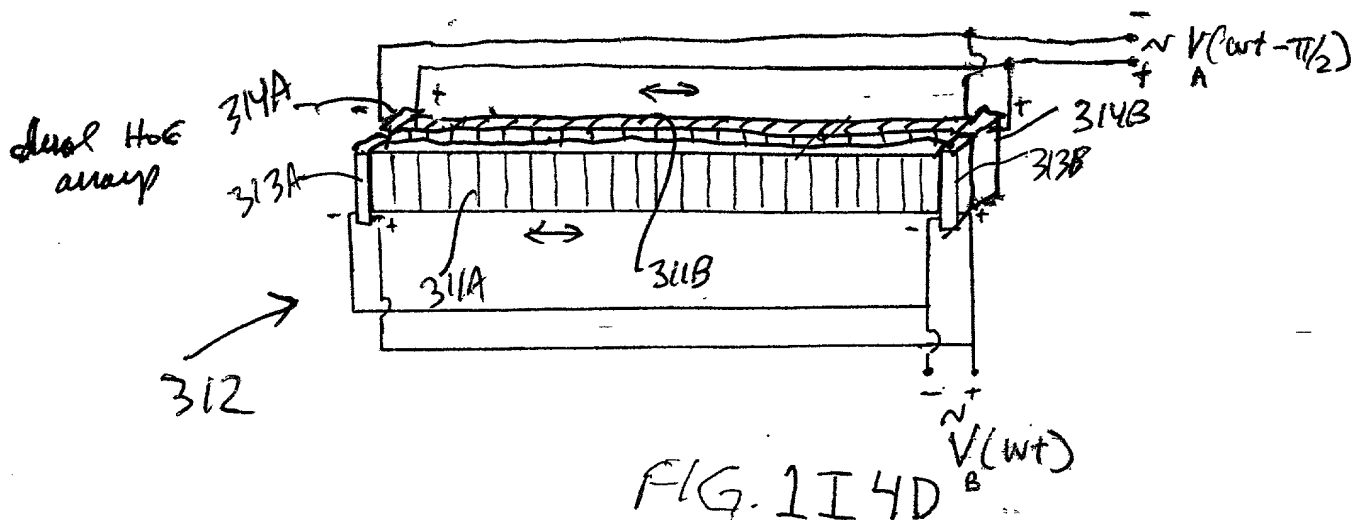
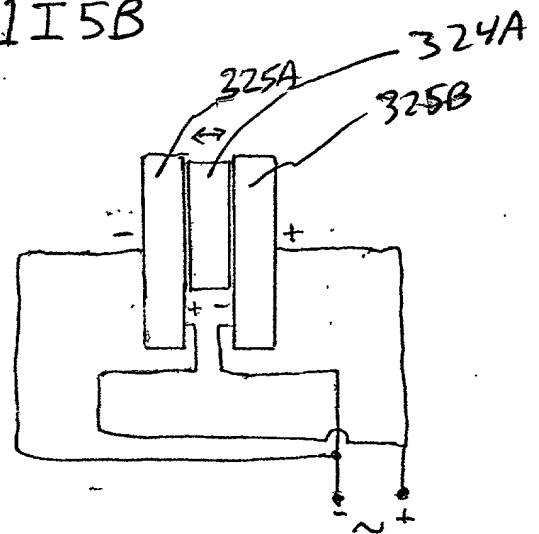
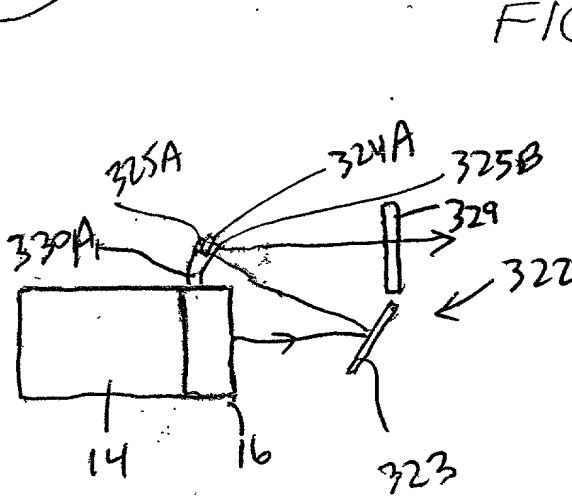
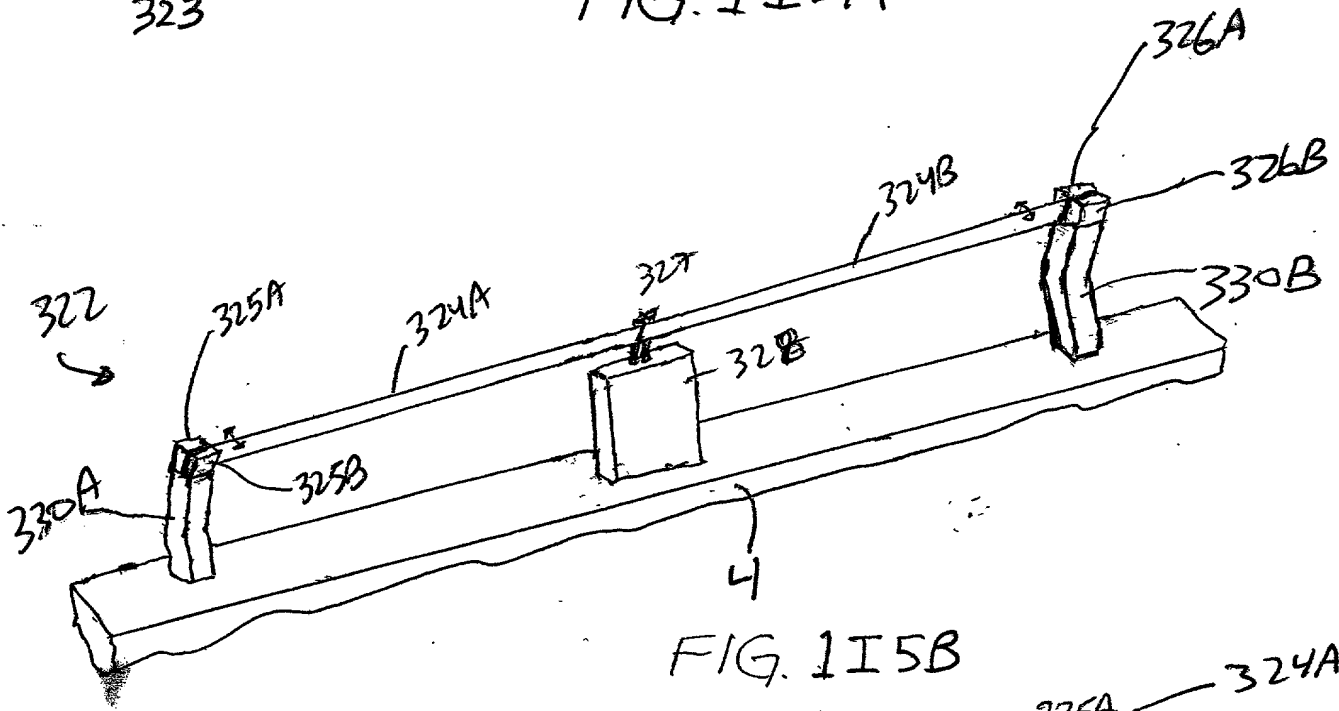
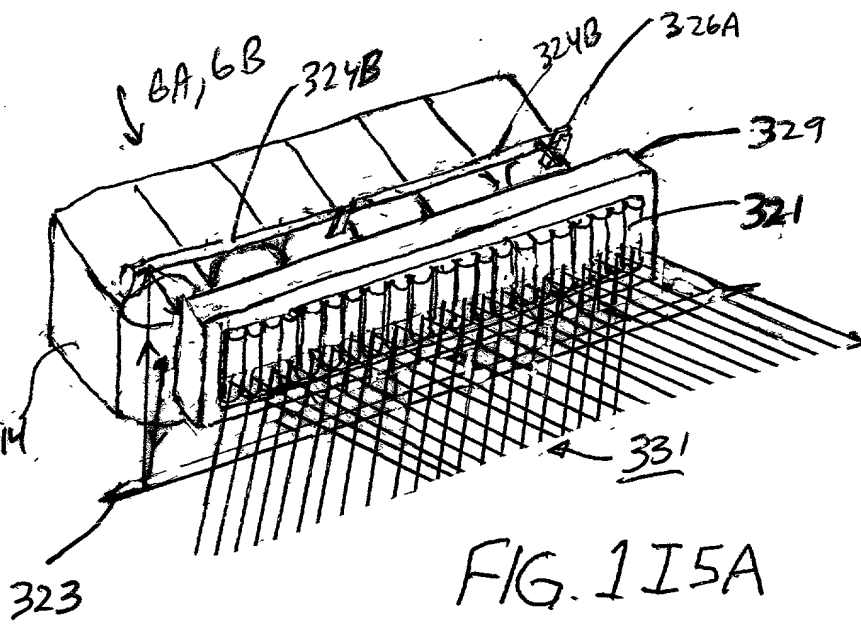


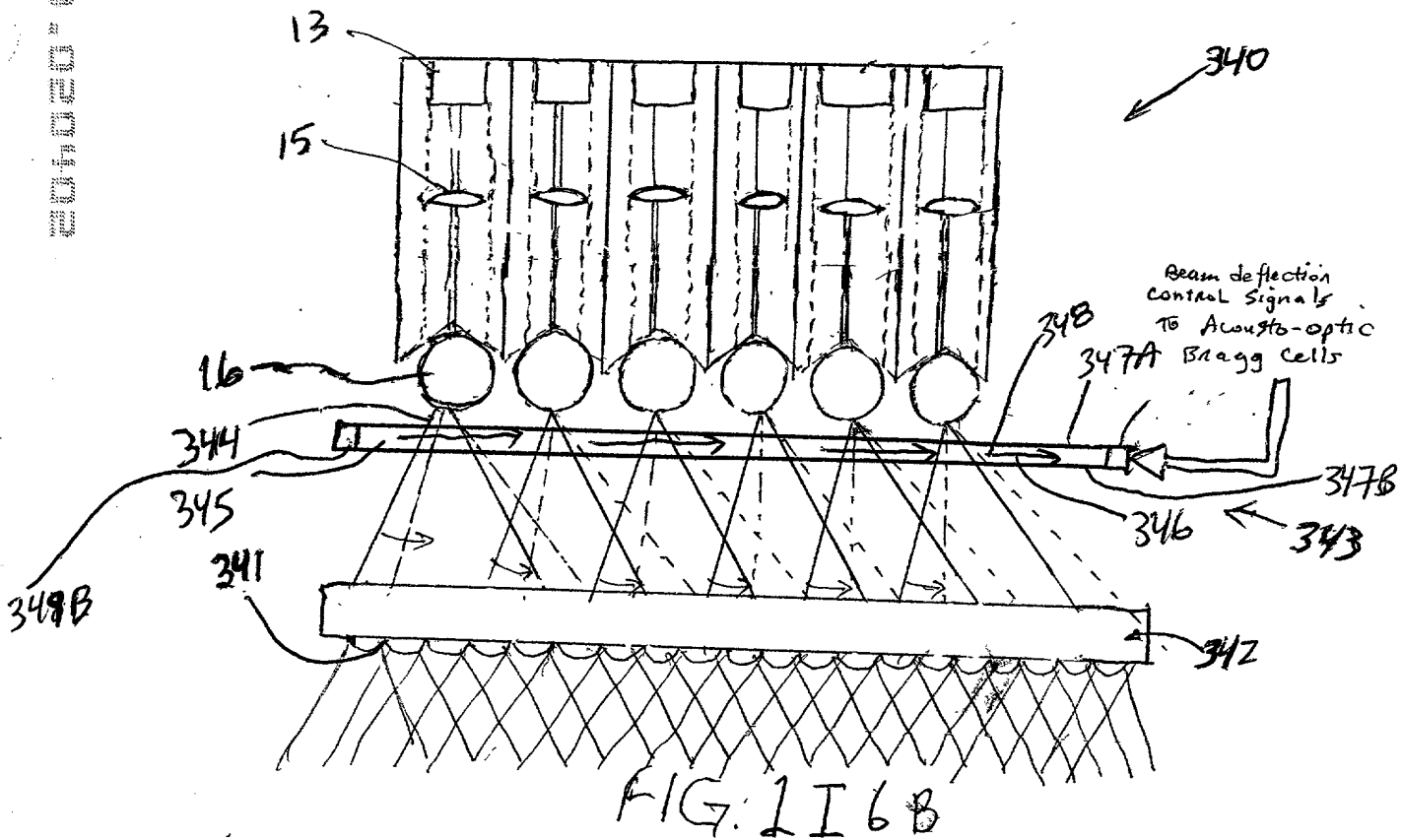
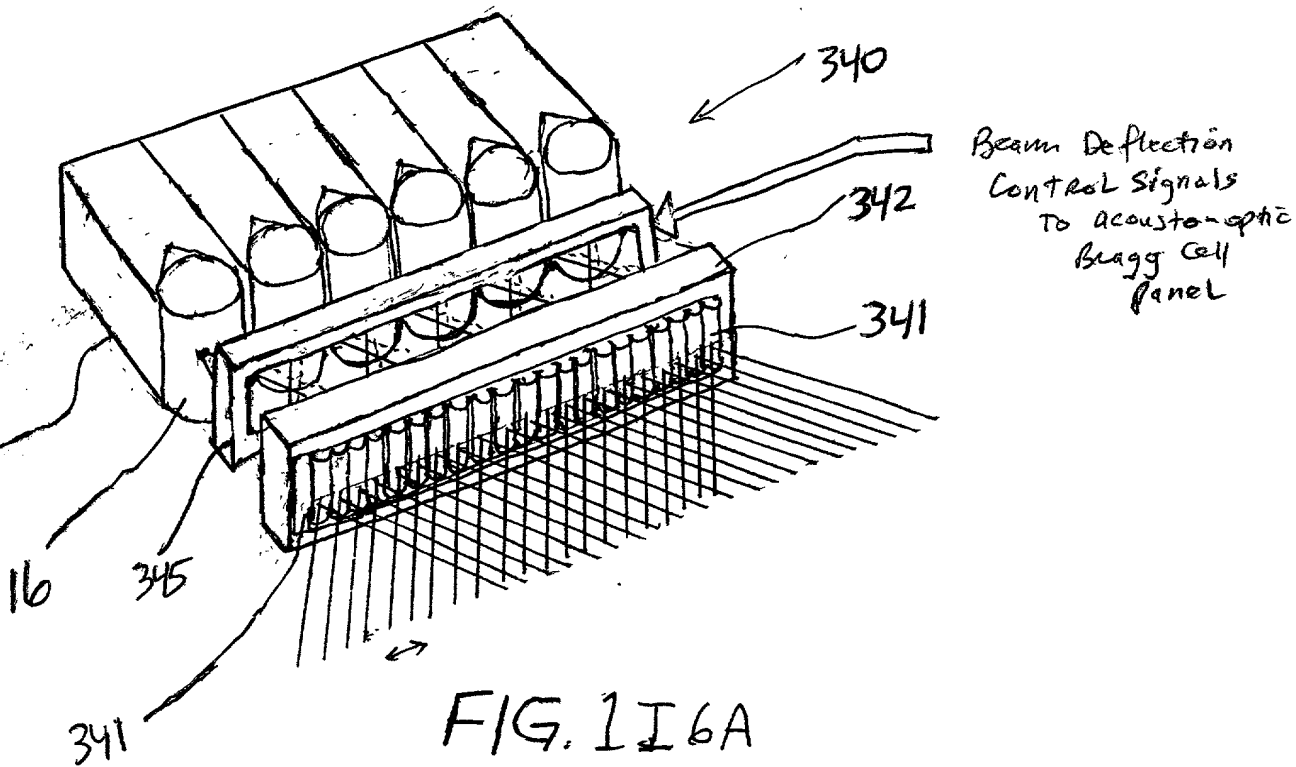
FIG. 1I4D

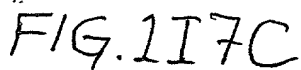
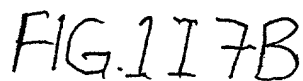
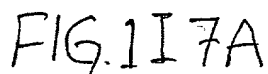


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DIPLOMA

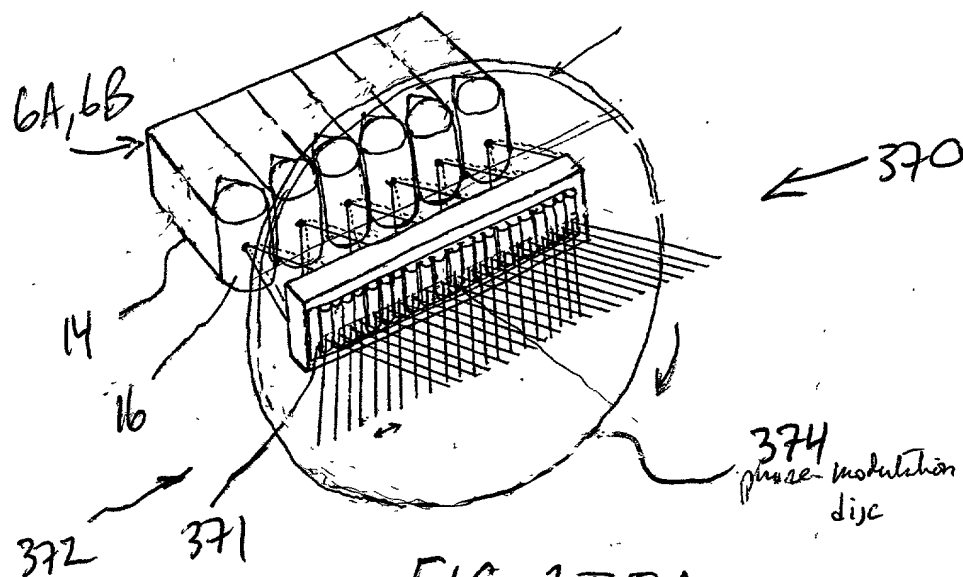


FIG. 1I8A

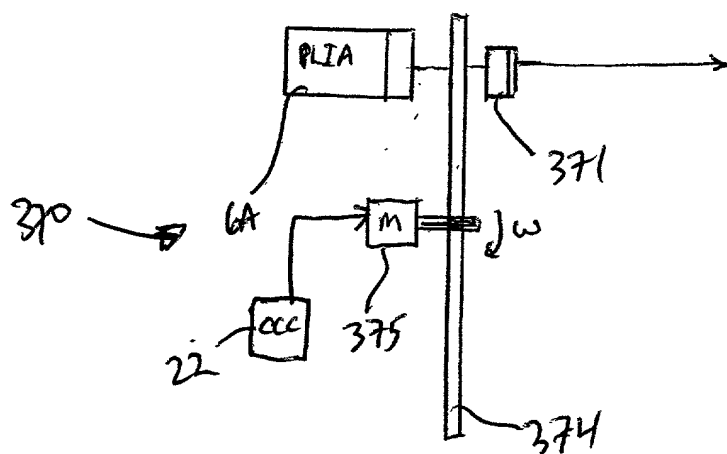


FIG. 118B

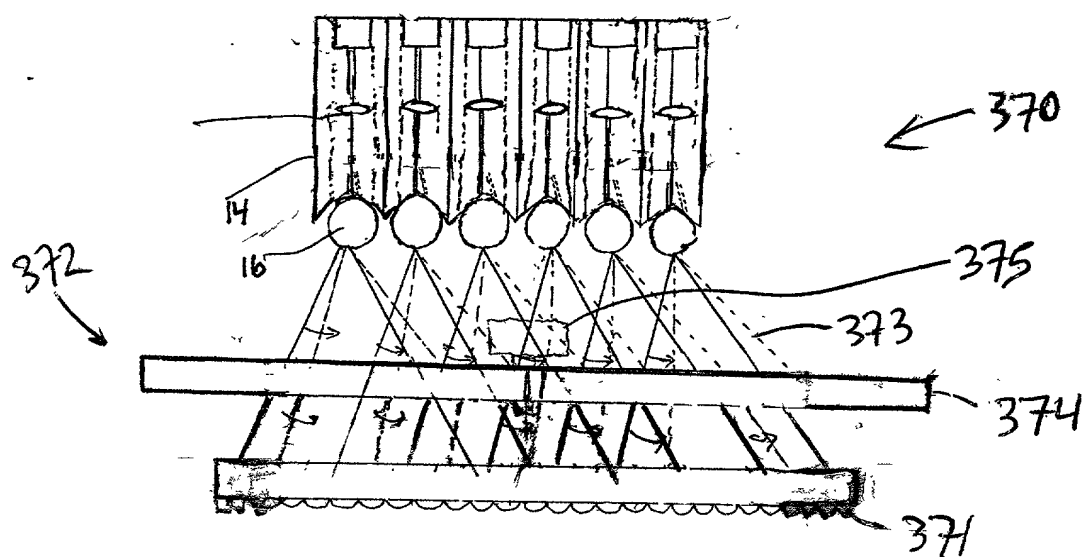


FIG. 1I8C

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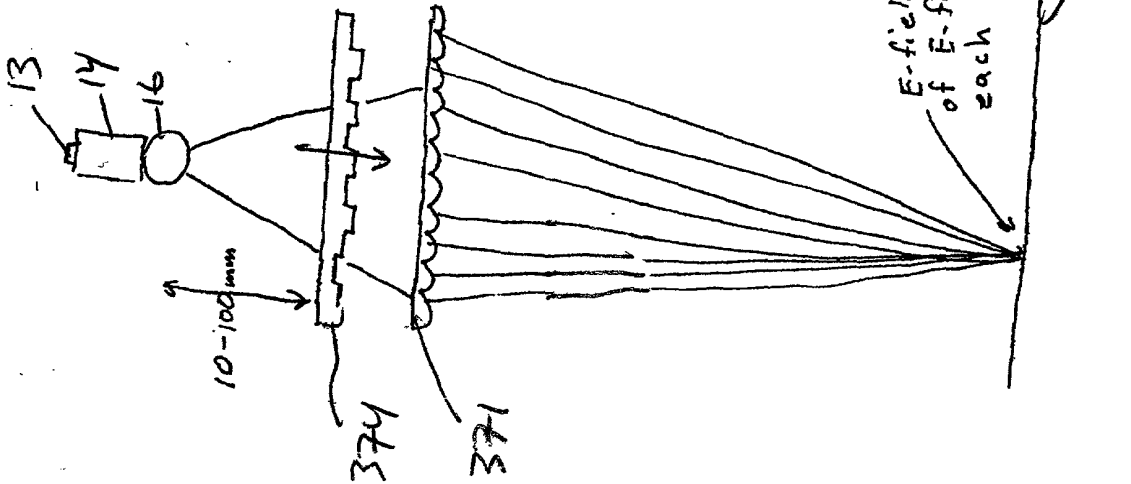


FIG 1I8E

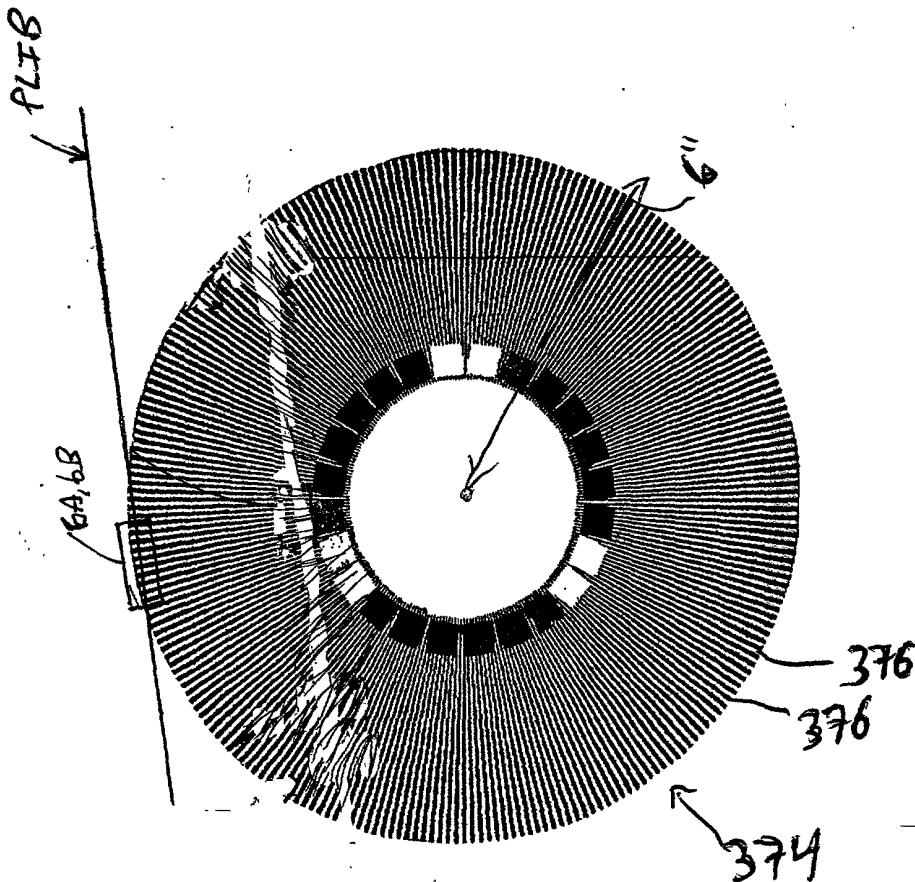
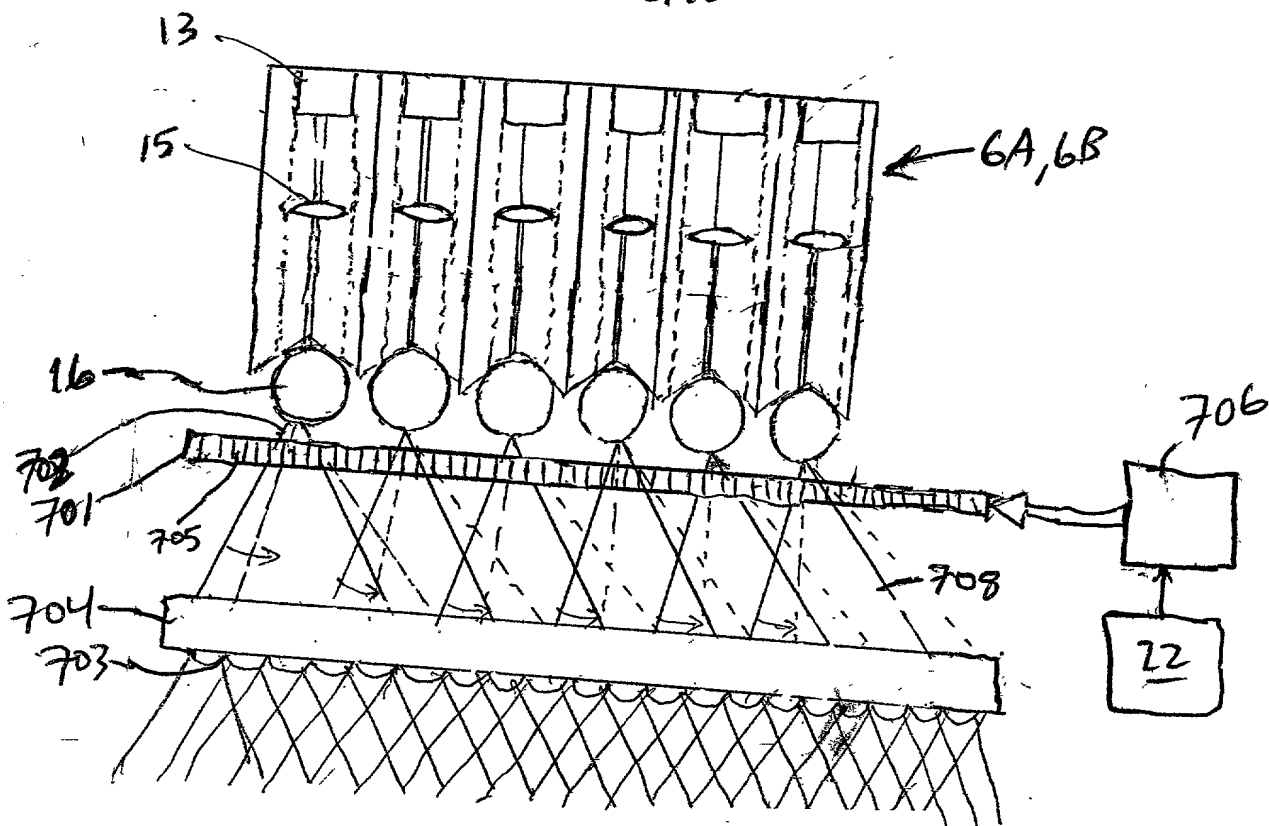
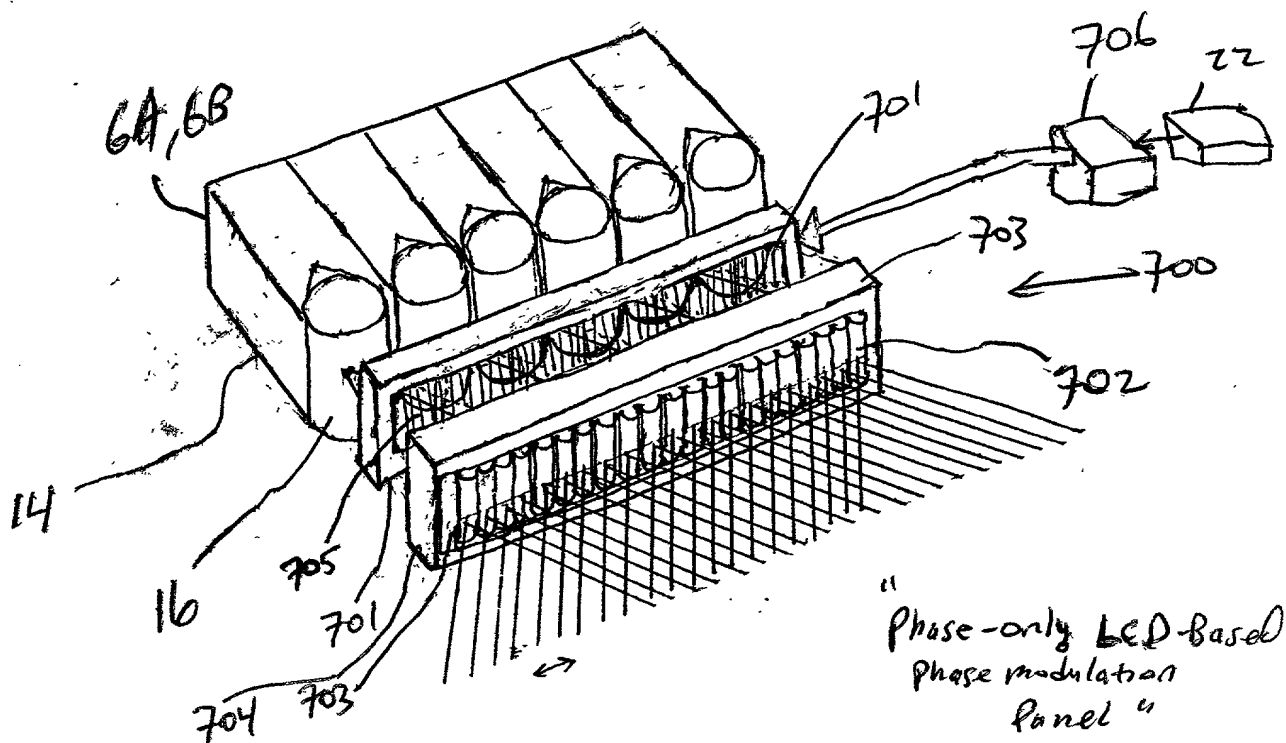


FIG 1I8D



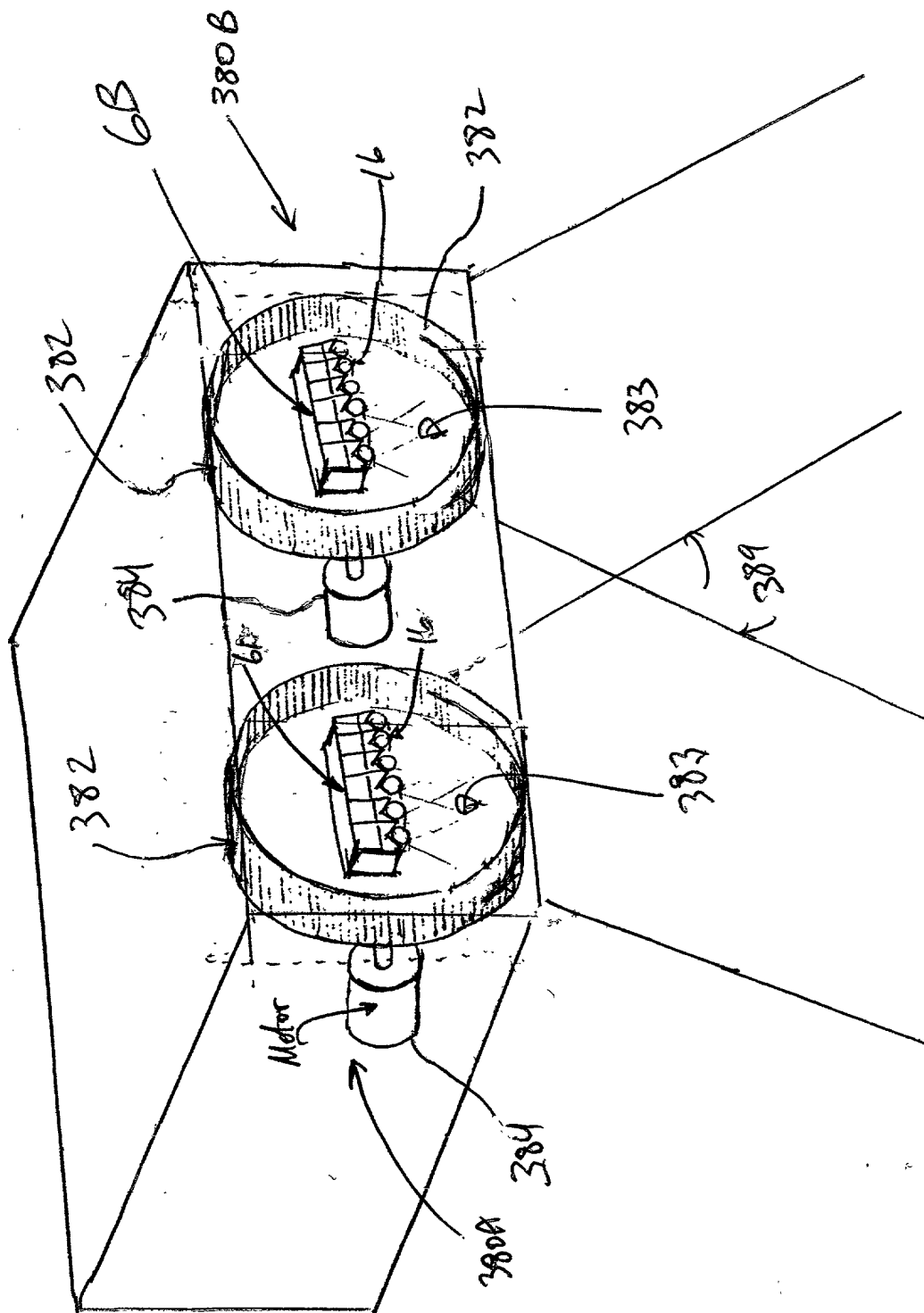
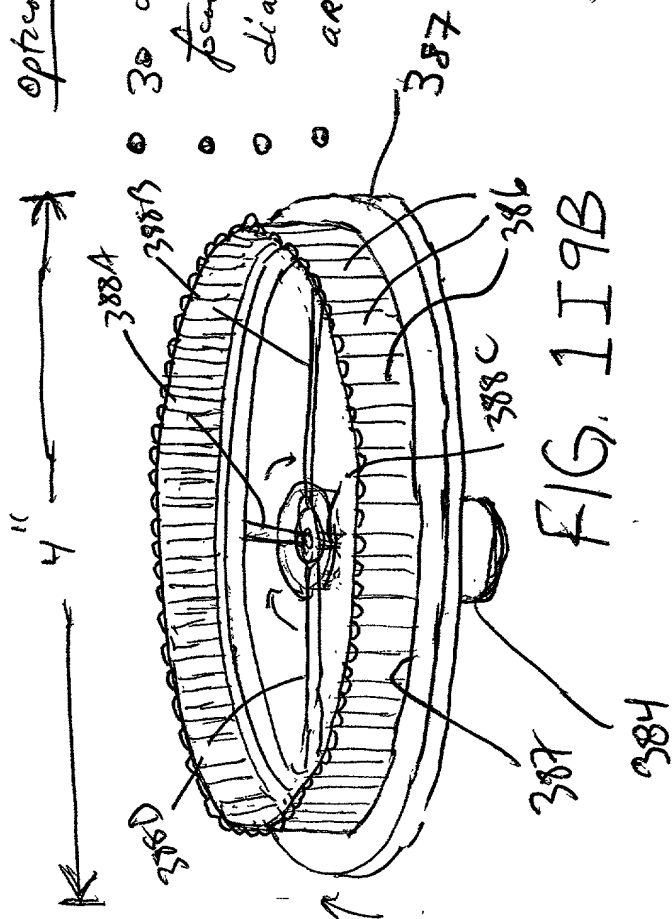


FIG. 1I 9A

Optical Specifications:

- 30 cylindrical lens (lenses) per linear inch
- focal length \approx 2.0 millimeters
- diameter of lens carrier carousel \approx 4 inches
- acrylic material



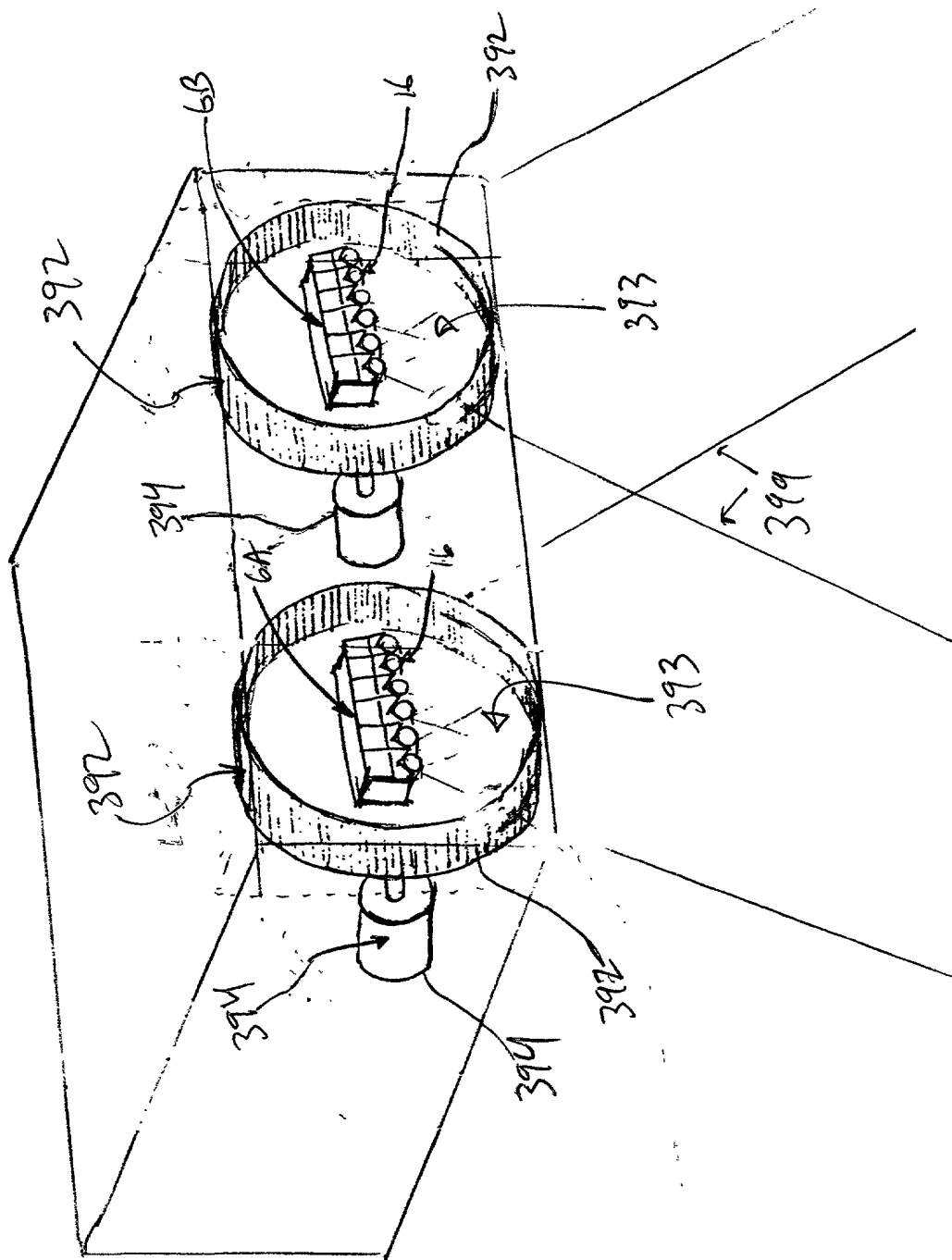


FIG. 1I 10A

Optical Specifications

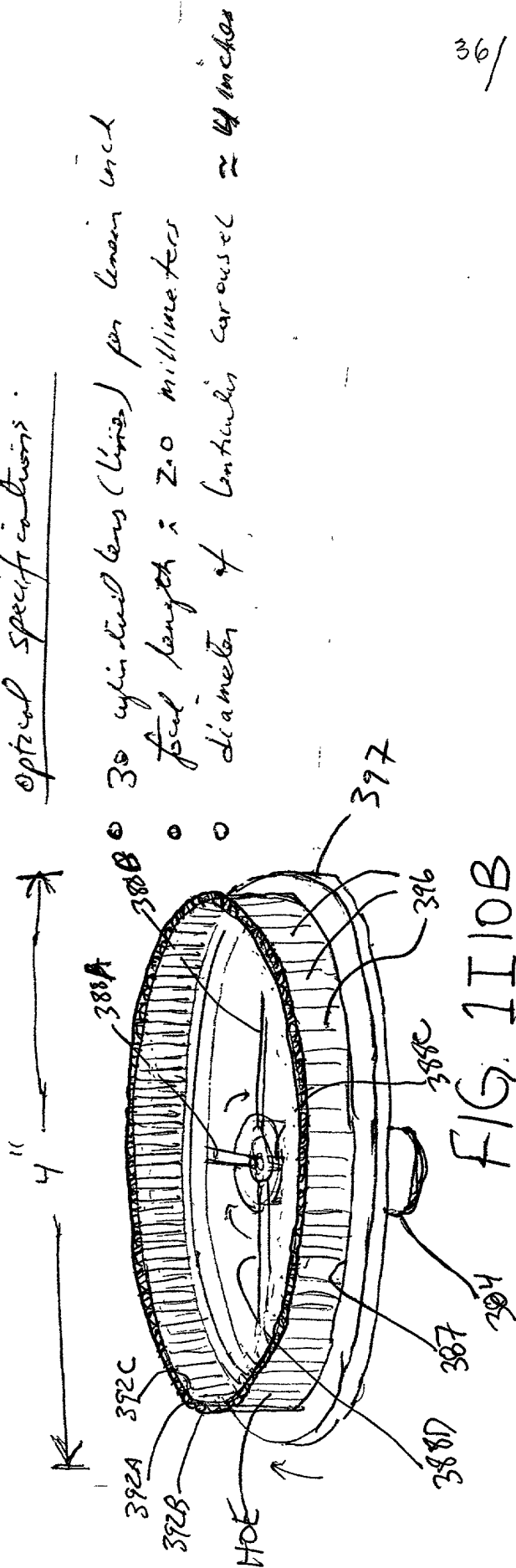
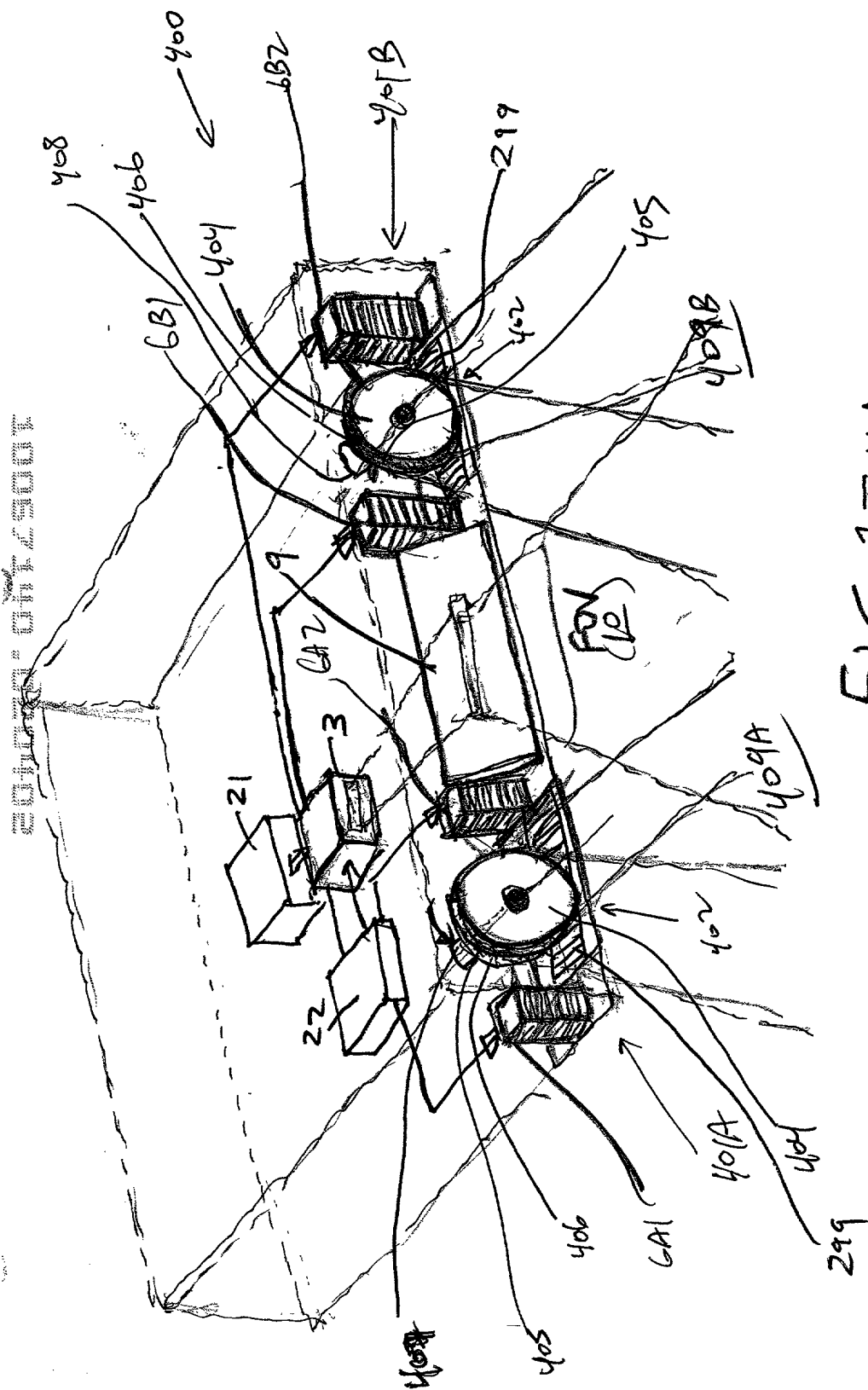


FIG. 1110B



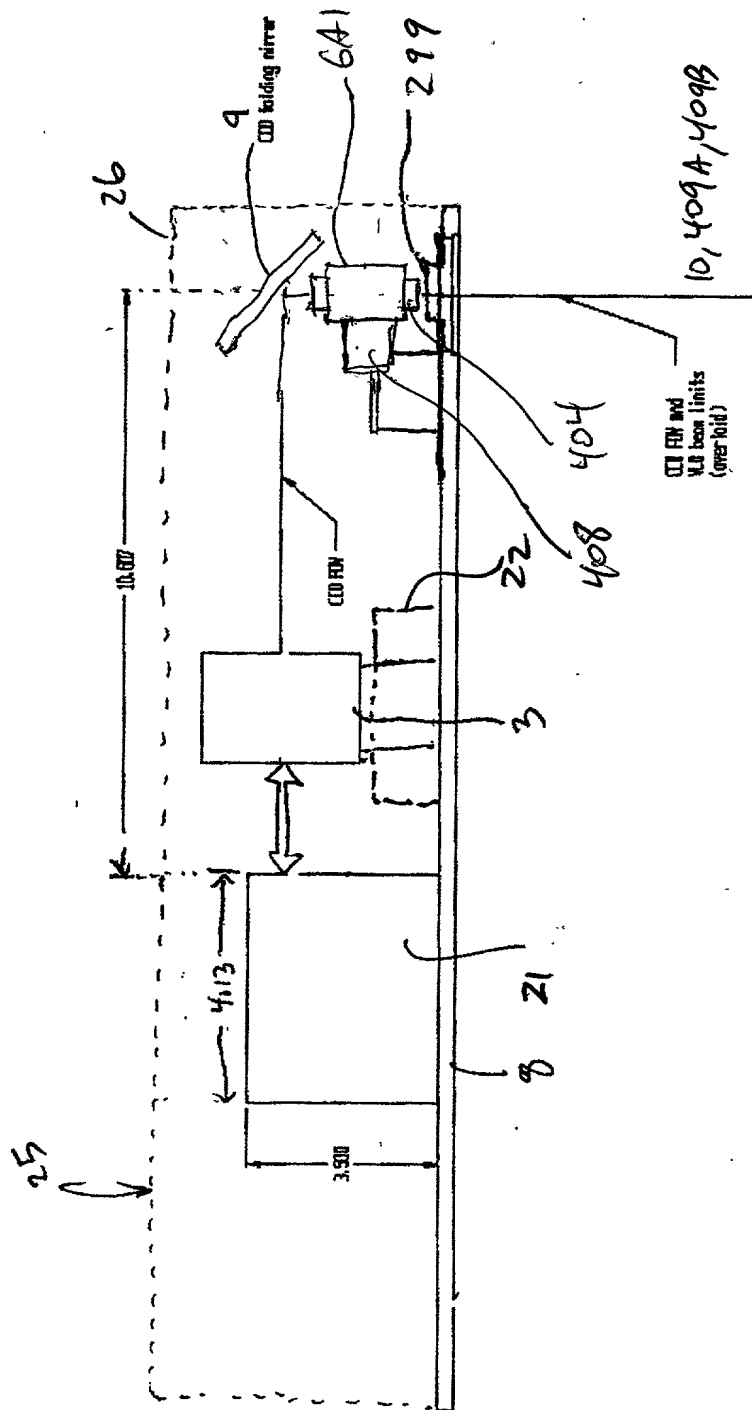


FIG 1I11B

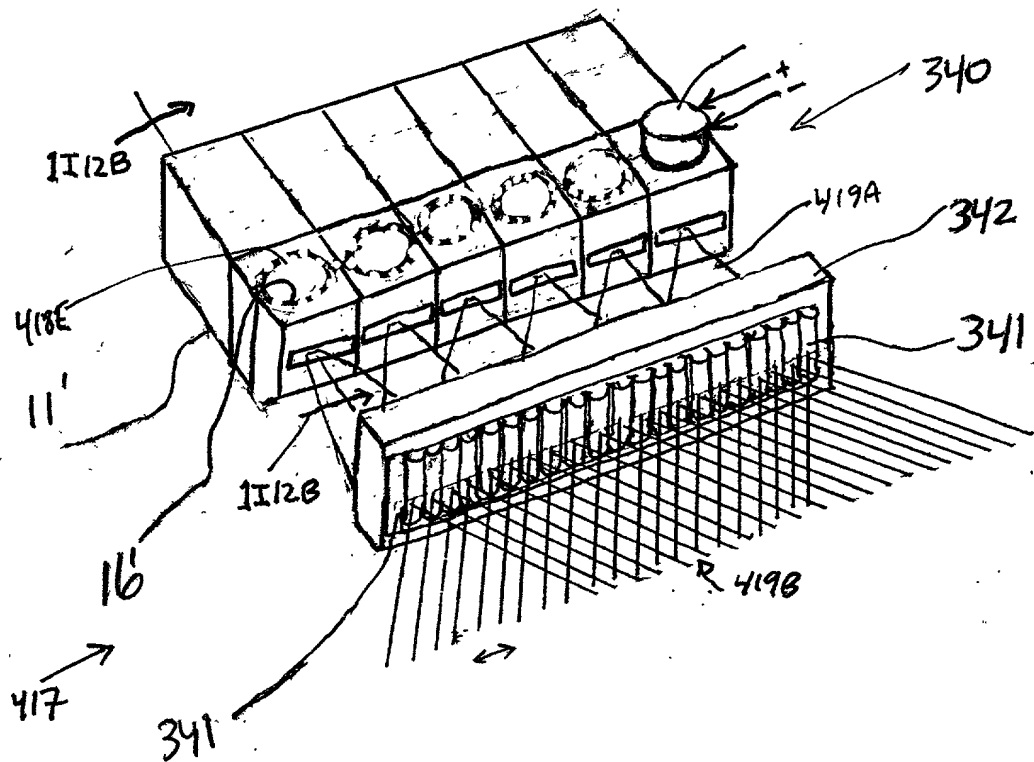


FIG. 1I12A

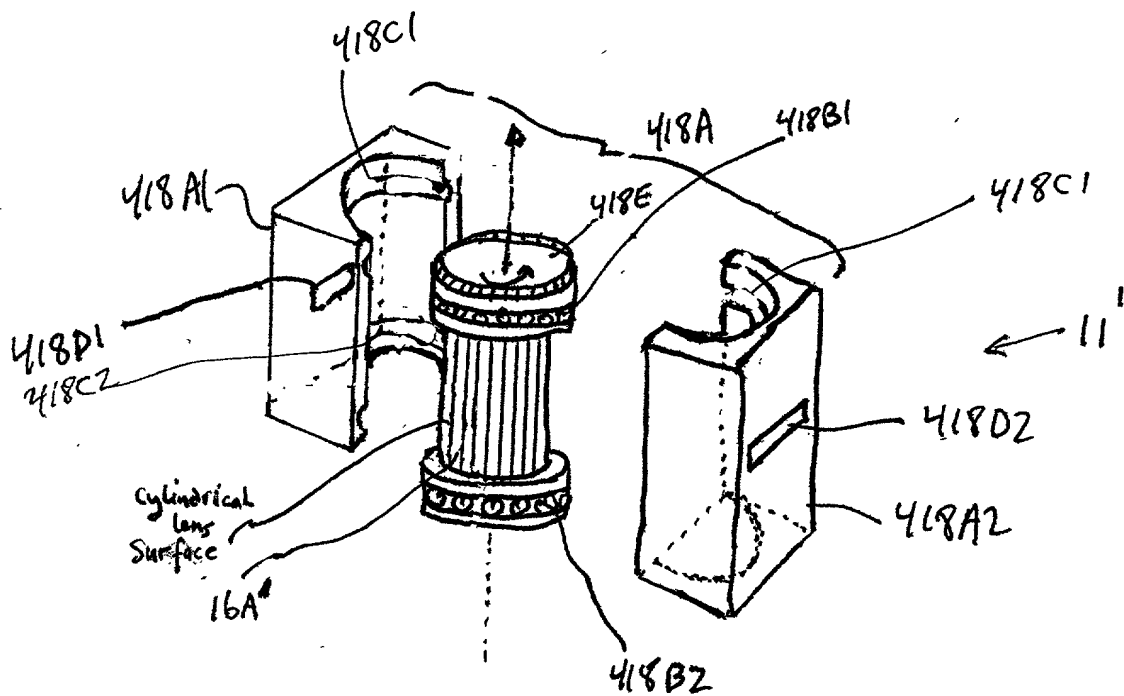


FIG. 1I12B

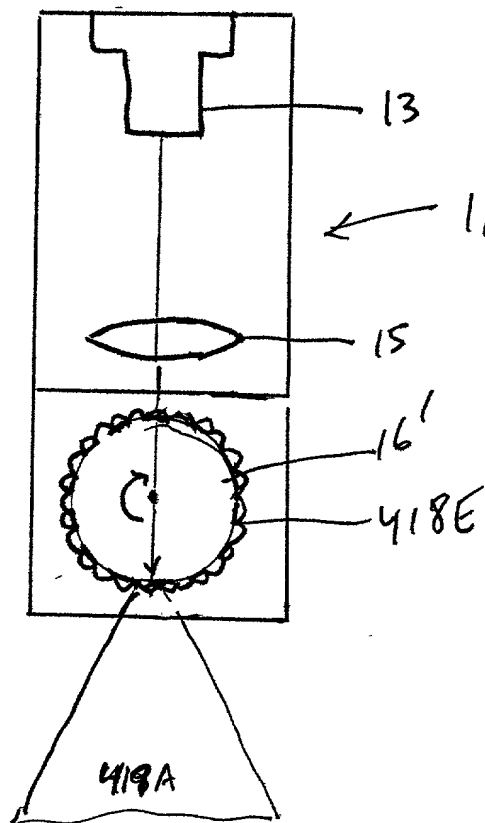


FIG. 1I12C

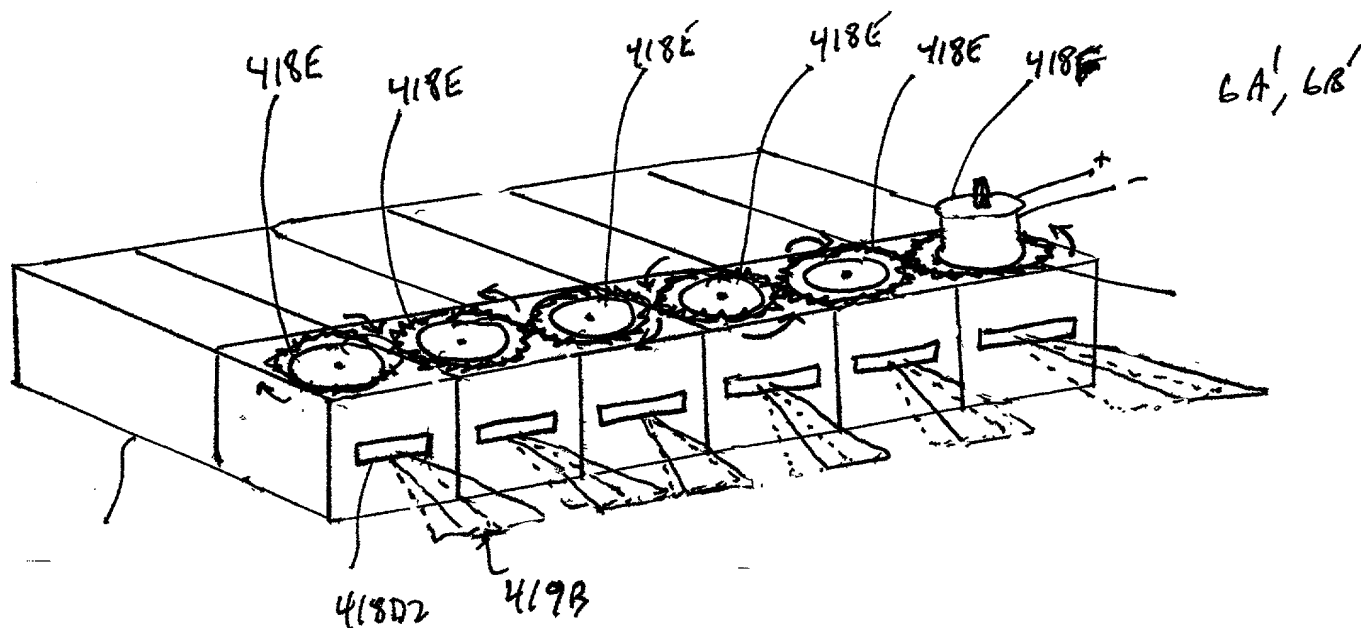


FIG. 1I12D

Second Generalized Method of
Reducing Speckle-Noise Patterns
at Image Detection Array
of the FFD Subsystem (3)

(TIME)

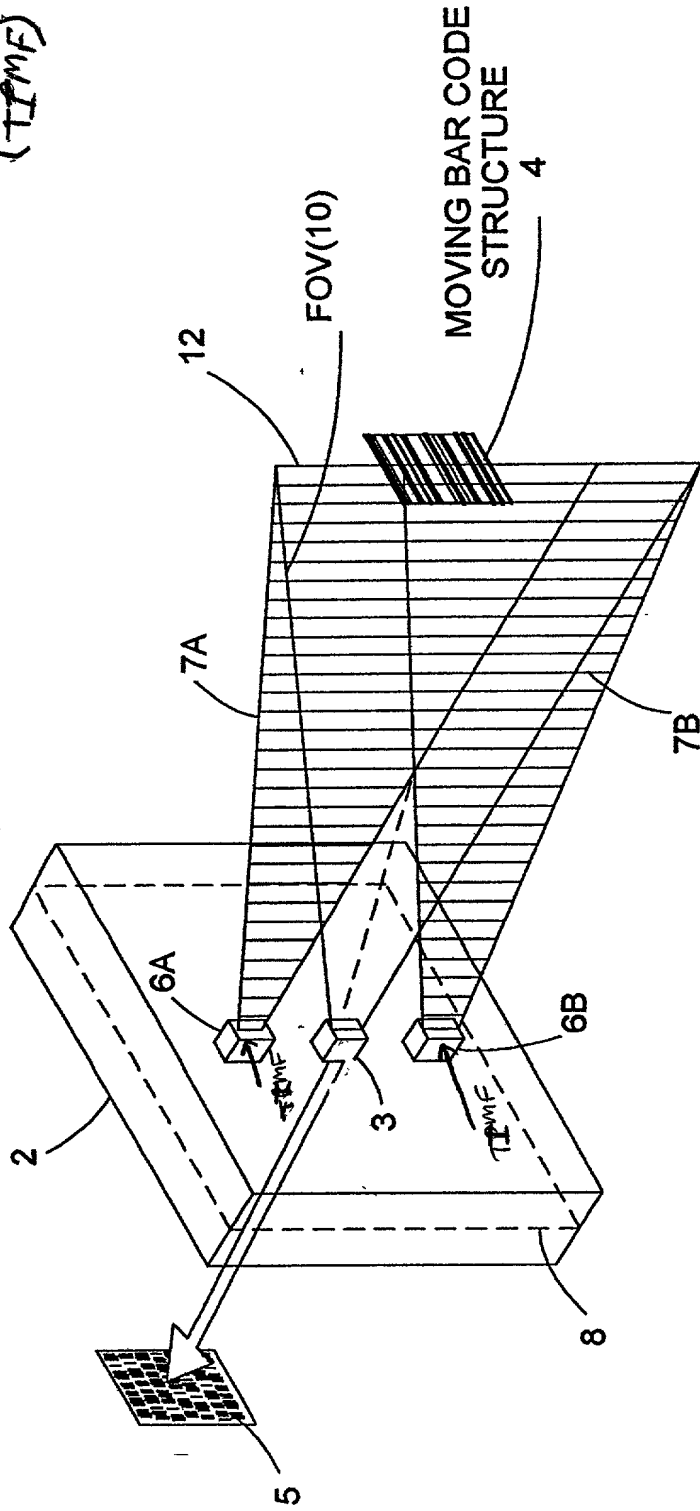


FIG. 11/13

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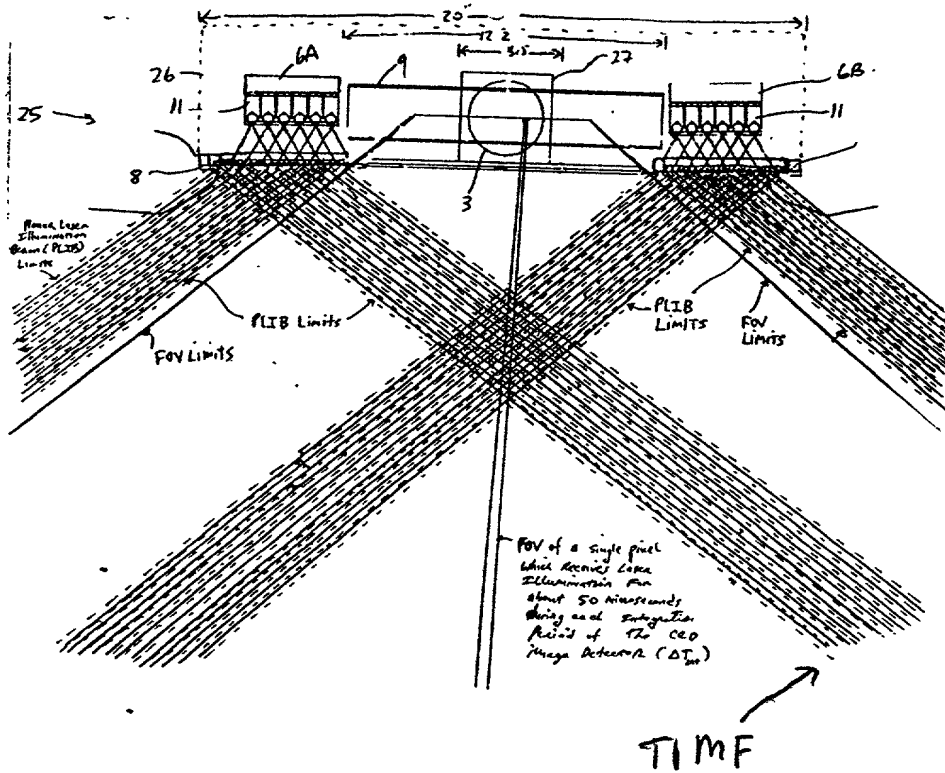


FIG. 1 I 13A

The Second Generalized Speckle-Noise Pattern Reduction Method
Of The Present Invention

Prior to illumination of the target with the planar laser illumination beam (PLIB), modulate the temporal intensity of the transmitted PLIB along the planar extent thereof according to a temporal intensity modulation function (TIMF) so as to

produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

Temporally average the numerous substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce power of the speckle-noise pattern observed at the image detection array.

FIG. 1I13B

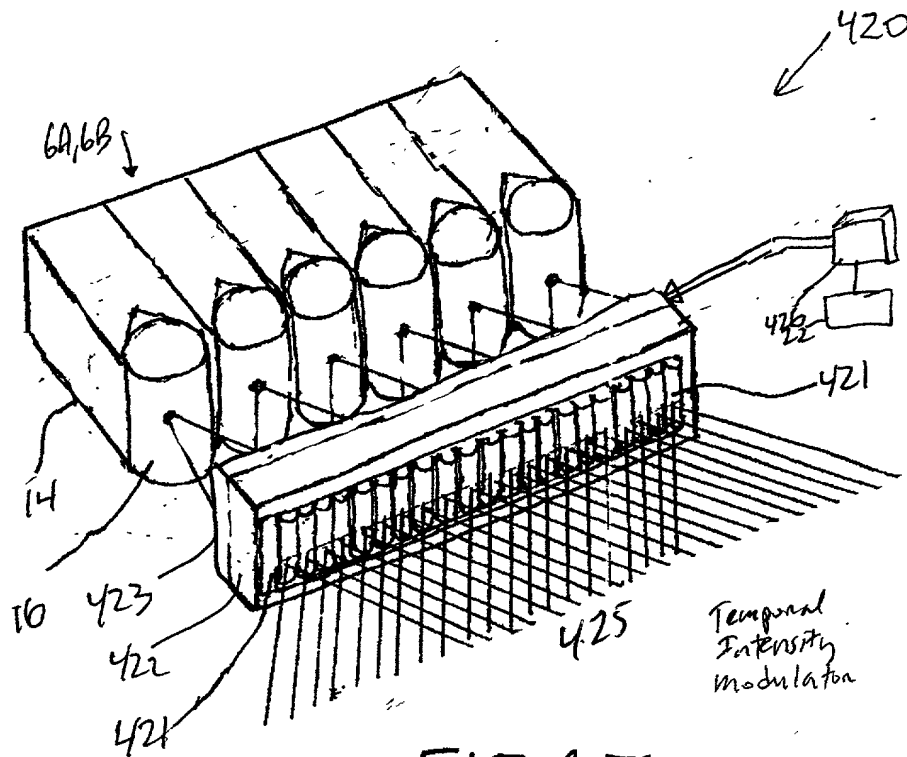


FIG. 1I14A

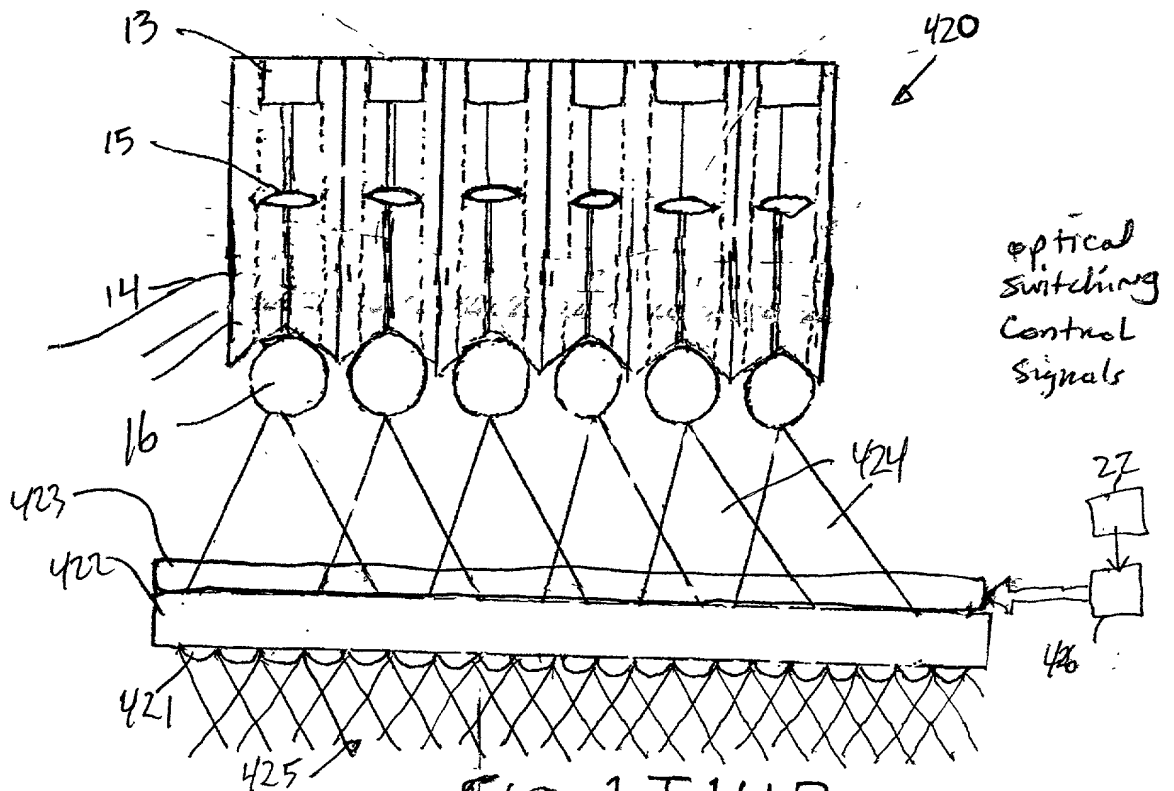
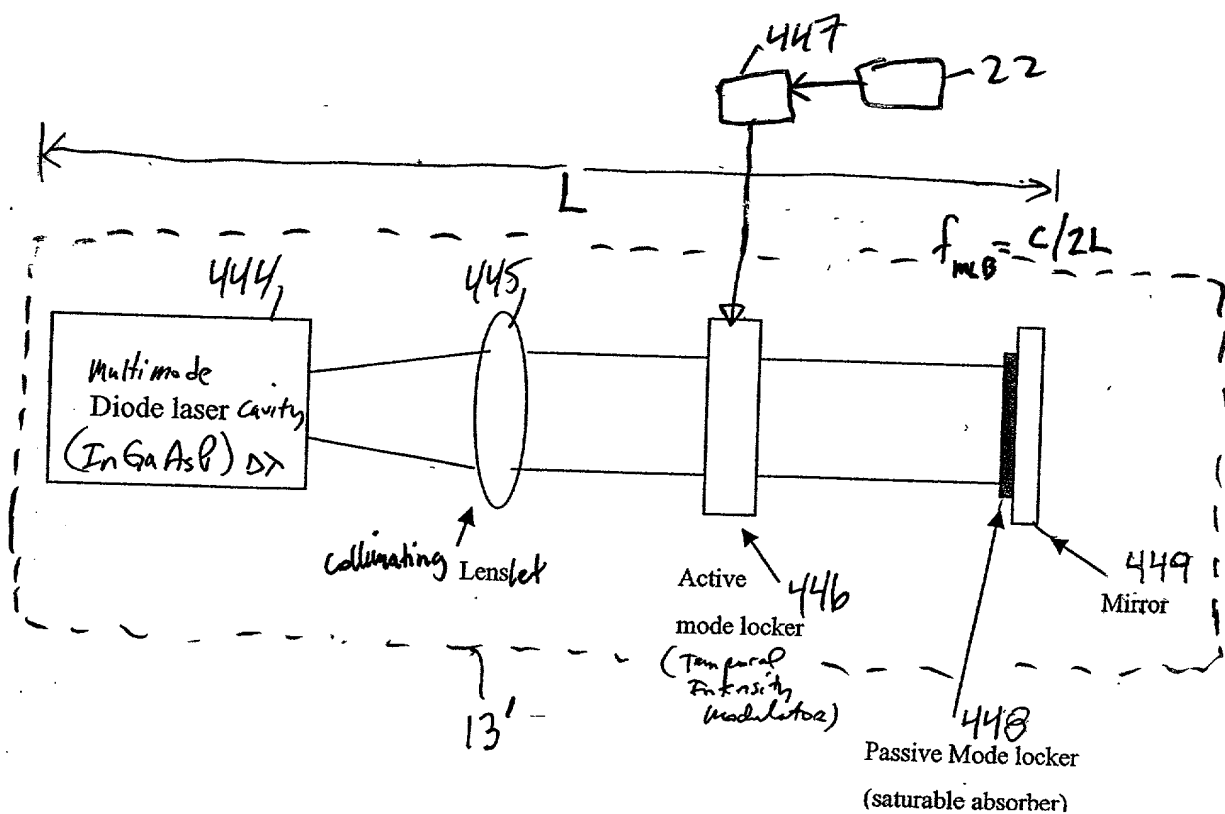
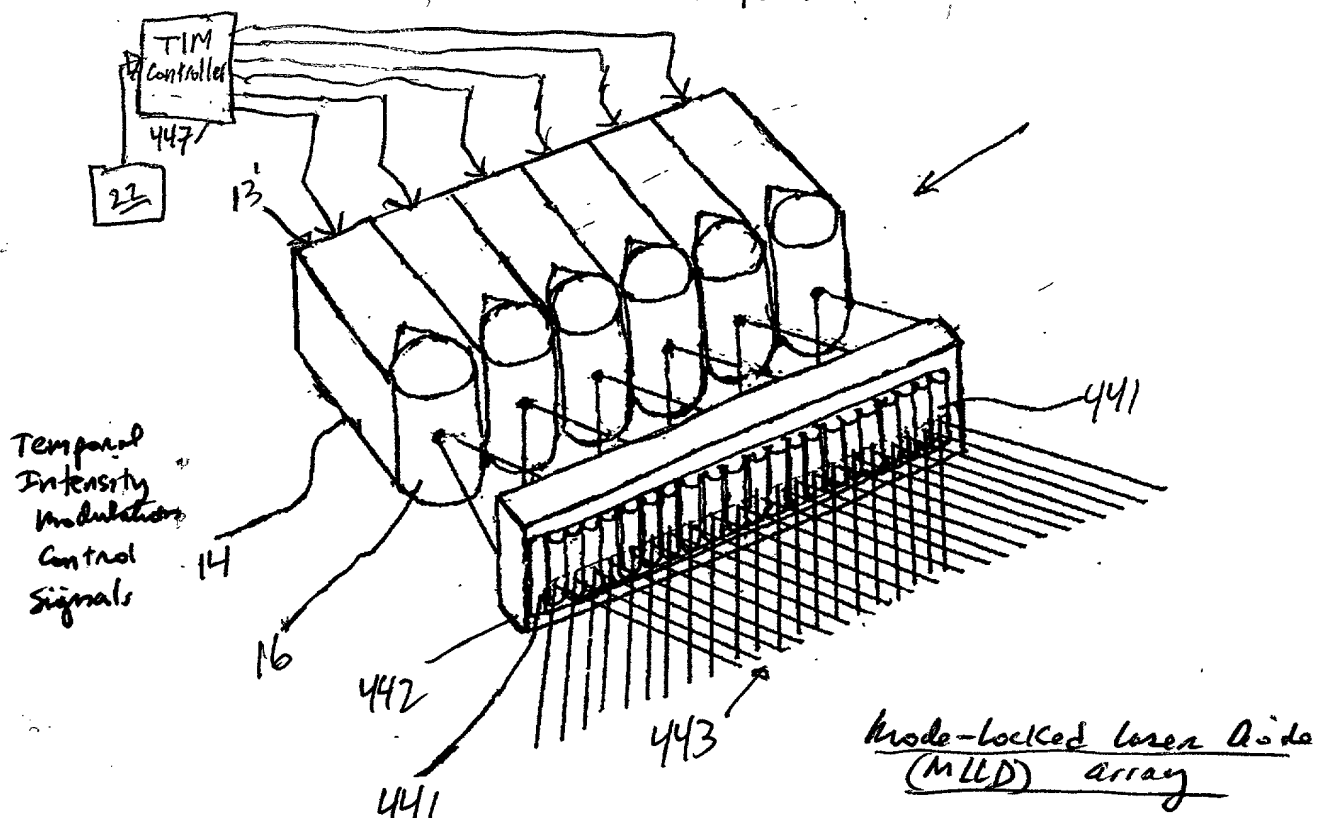
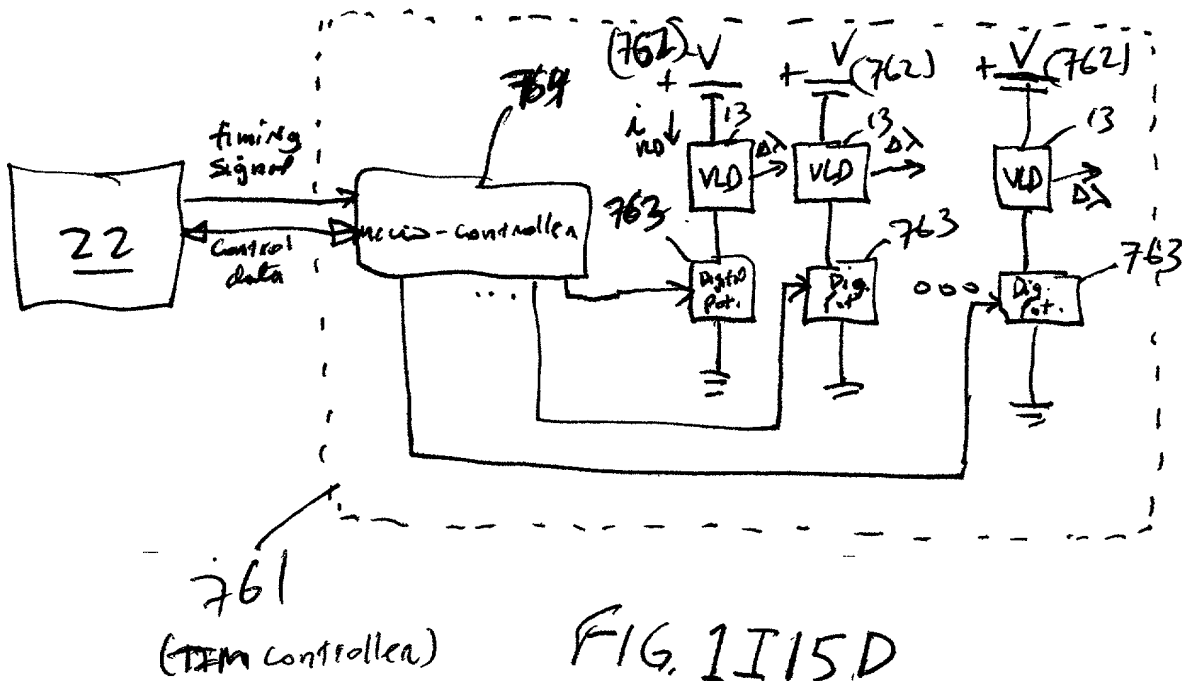
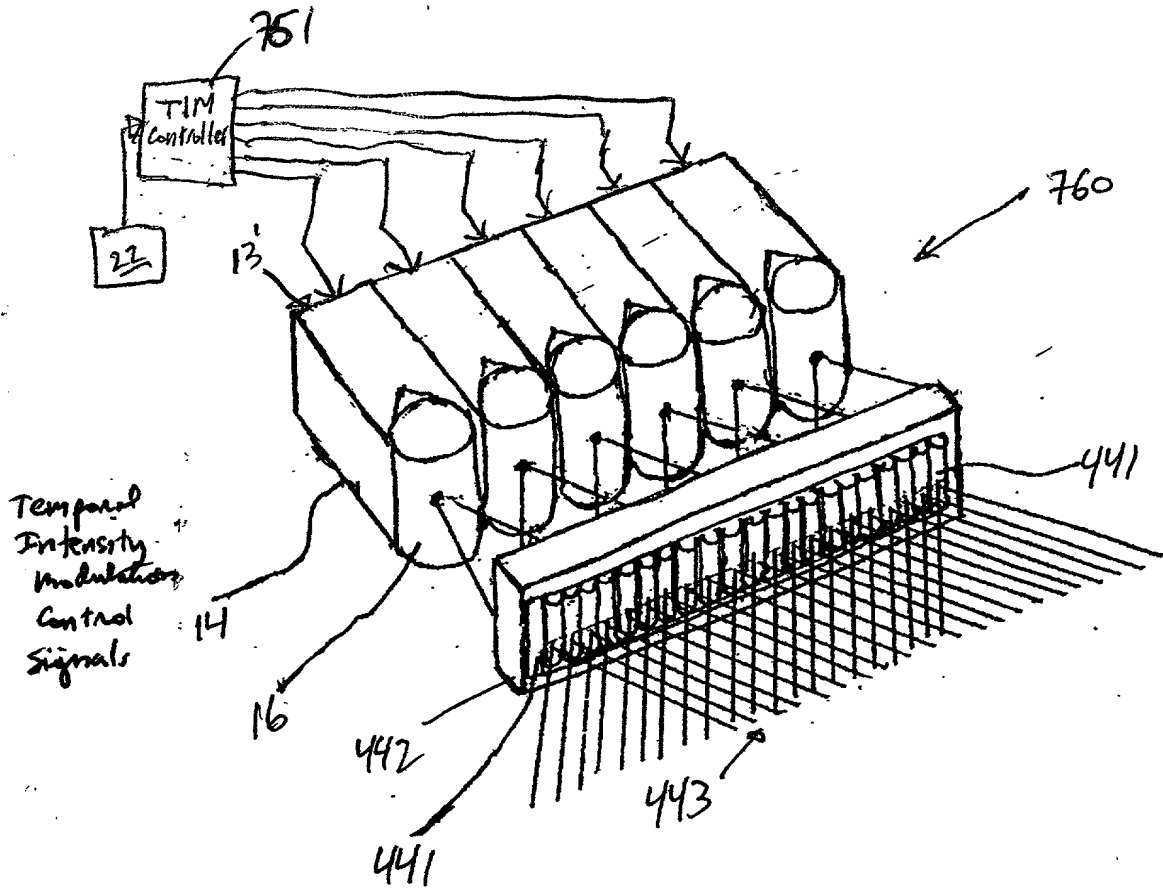


FIG. 1I14B





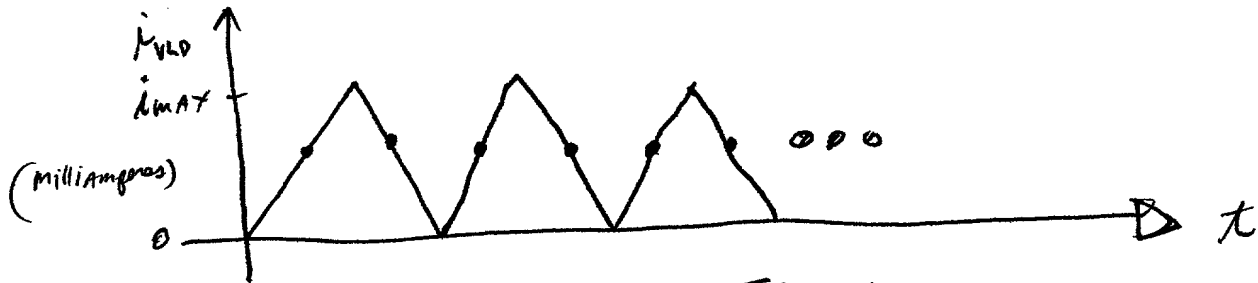


FIG. 1I15E



FIG. 1I15F

2025 RELEASE UNDER E.O. 14176

Third Generalized Method of
Reducing Spokele-Noise Patterns
at Image Detection Array
of the FFD Subsystem (3)

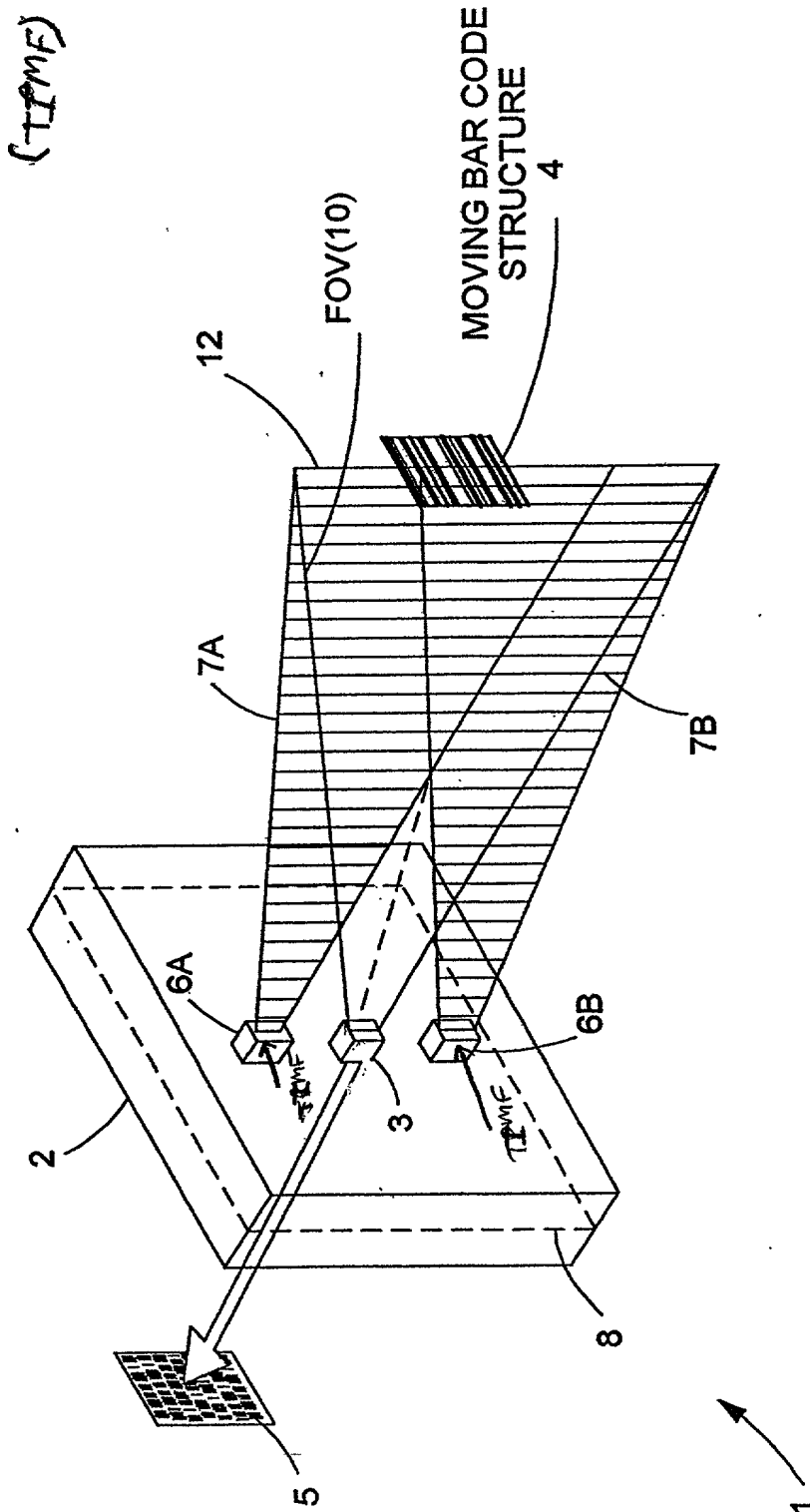


FIG. 1116

Third Generalized Speckle-Noise Pattern Reduction Method
Of The Present Invention

Prior to illumination of the target with the planar laser illumination beam (PLIB), modulate the temporal *phase* of the transmitted PLIB ~~along the planar extent thereof~~ according to a *Temporal phase* modulation function (TPMF) so as to:

produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

↓

Temporally average the numerous substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce power of the speckle-noise pattern observed at the image detection array.

FIG. 1I/6B

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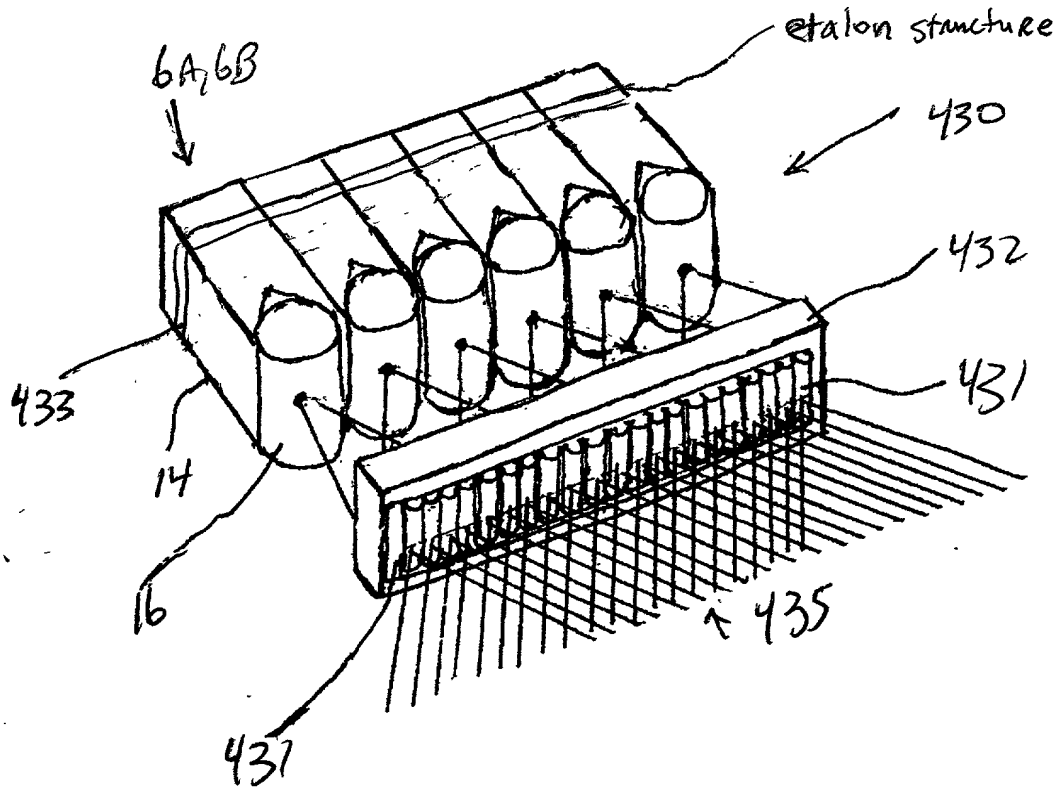


FIG. 1I17A

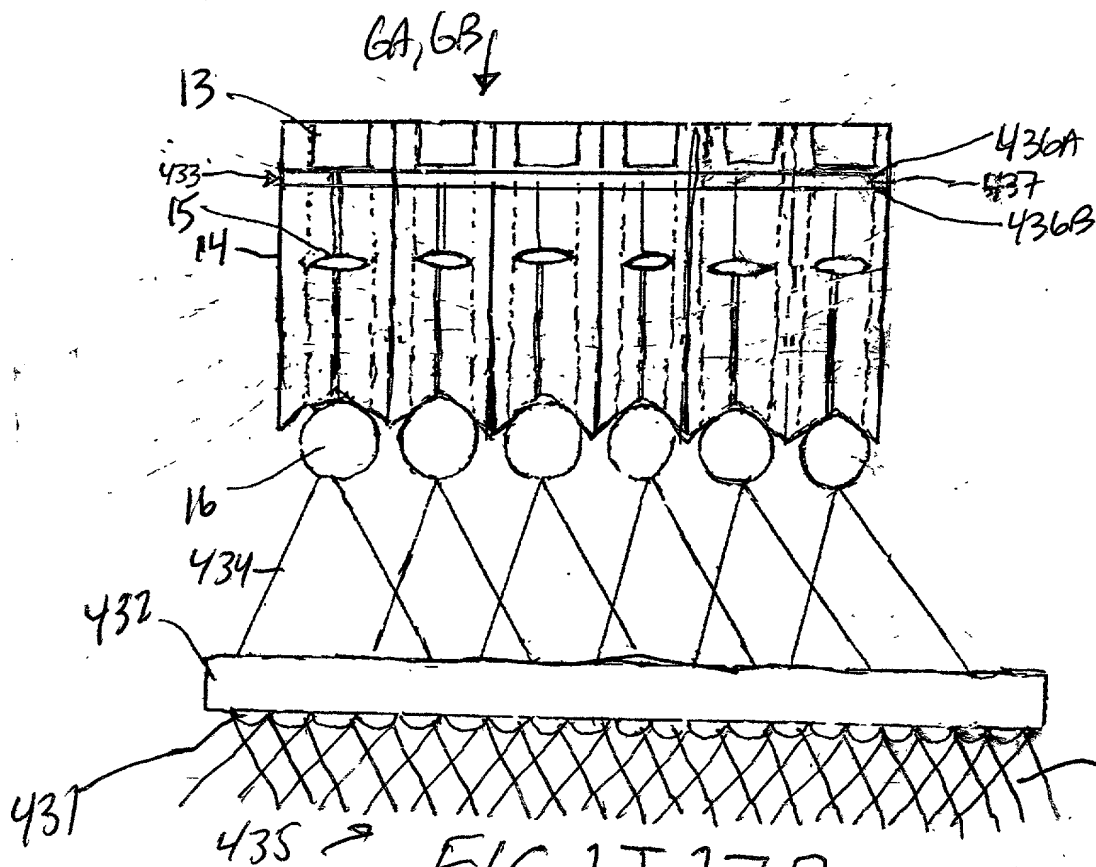


FIG. 1I17B

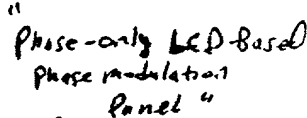


FIG. 11/7D

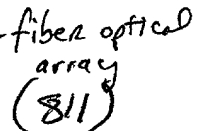
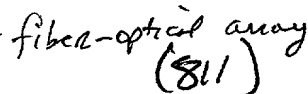


FIG. 1117E

Fourth Generalized Method of
Reducing Speckle-Noise Patterns
at Image Detection Array
of the FFD Subsystem (3)

(TFMP)

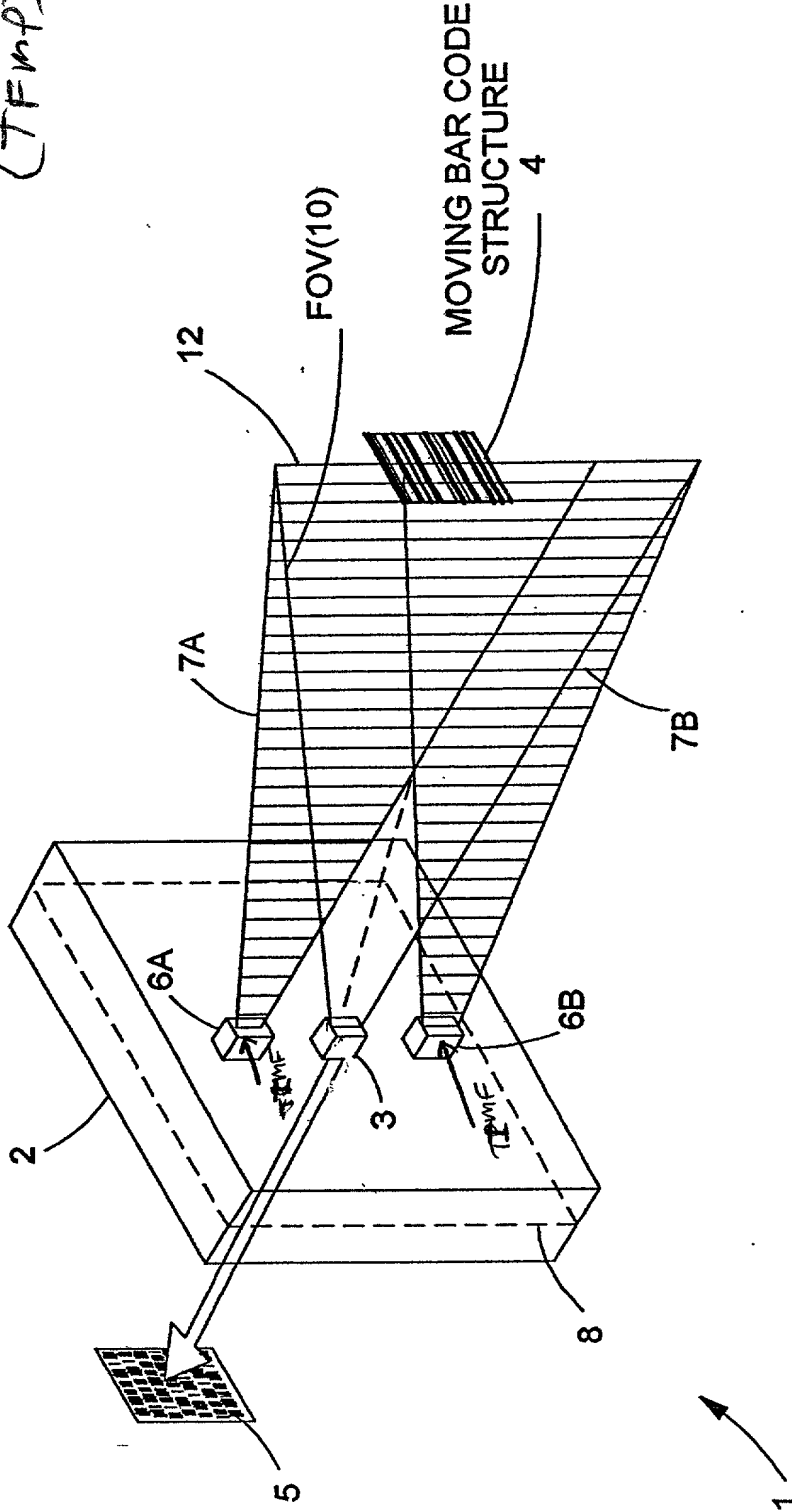


FIG. 1118A

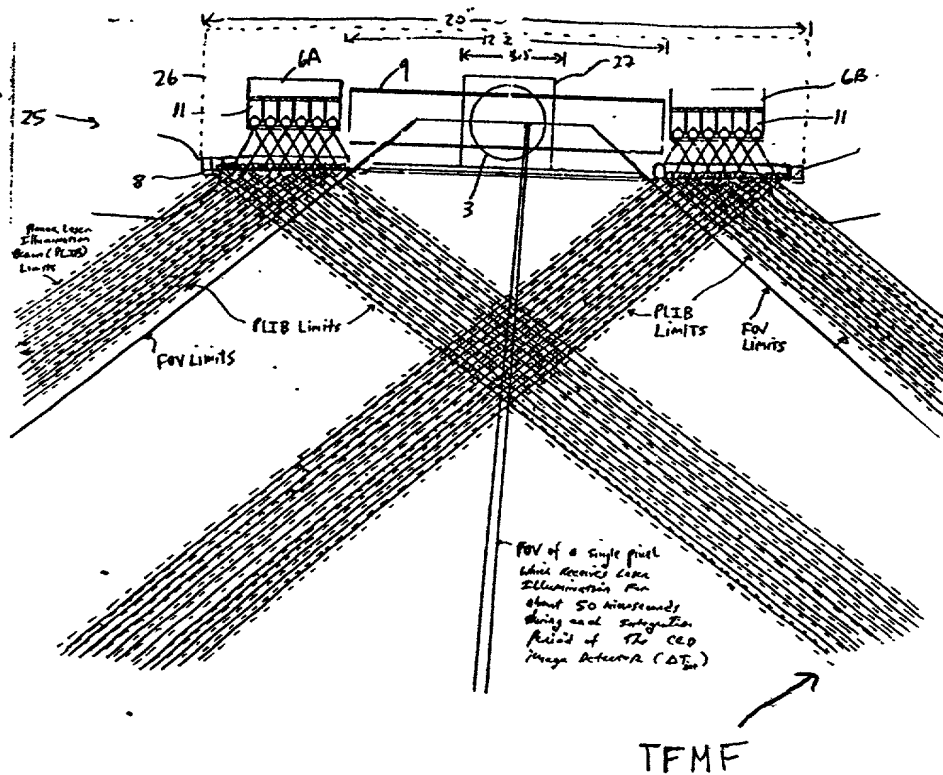


FIG. 1 I 18A

Fourth Generalized Speckle-Noise Pattern Reduction Method
Of The Present Invention

Prior to illumination of the target with the planar laser illumination beam (PLIB), modulate the temporal frequency of the transmitted PLIB according to a temporal intensity modulation function (T IMF) so as to ;

produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

Temporally average the numerous substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce power of the speckle-noise pattern observed at the image detection array.

FIG. 1118B

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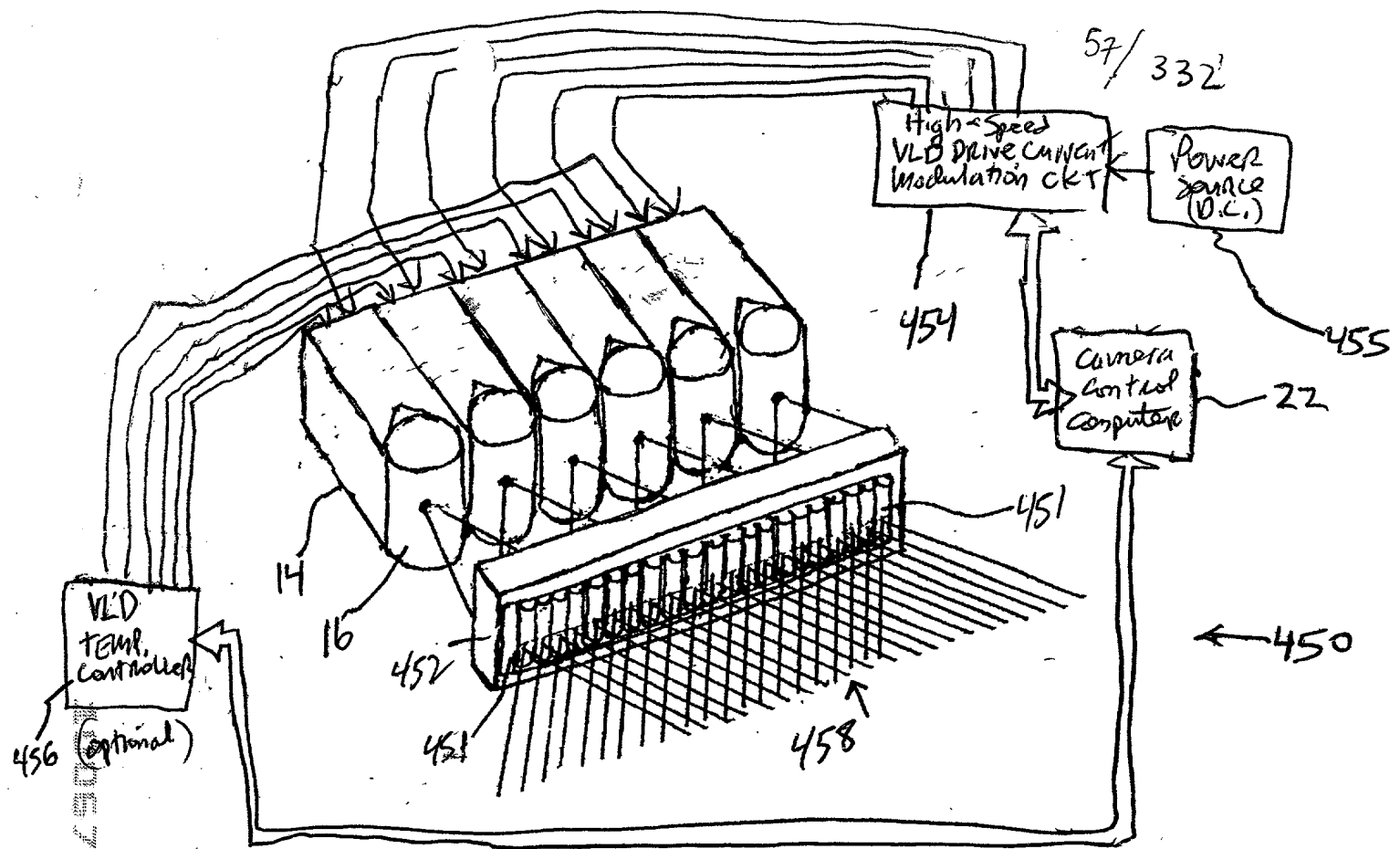


FIG. 1I 19A

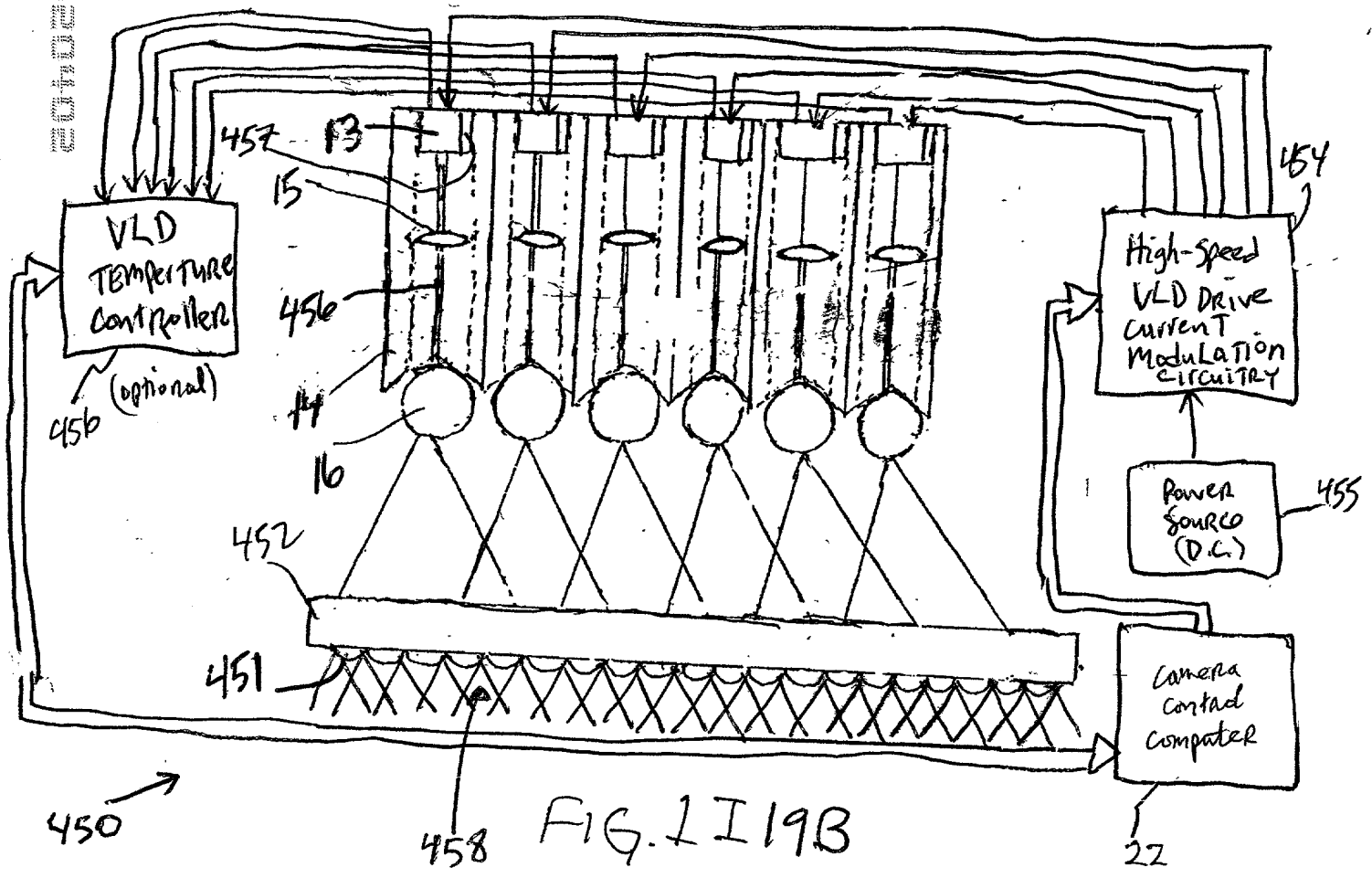


FIG. 1I 19B

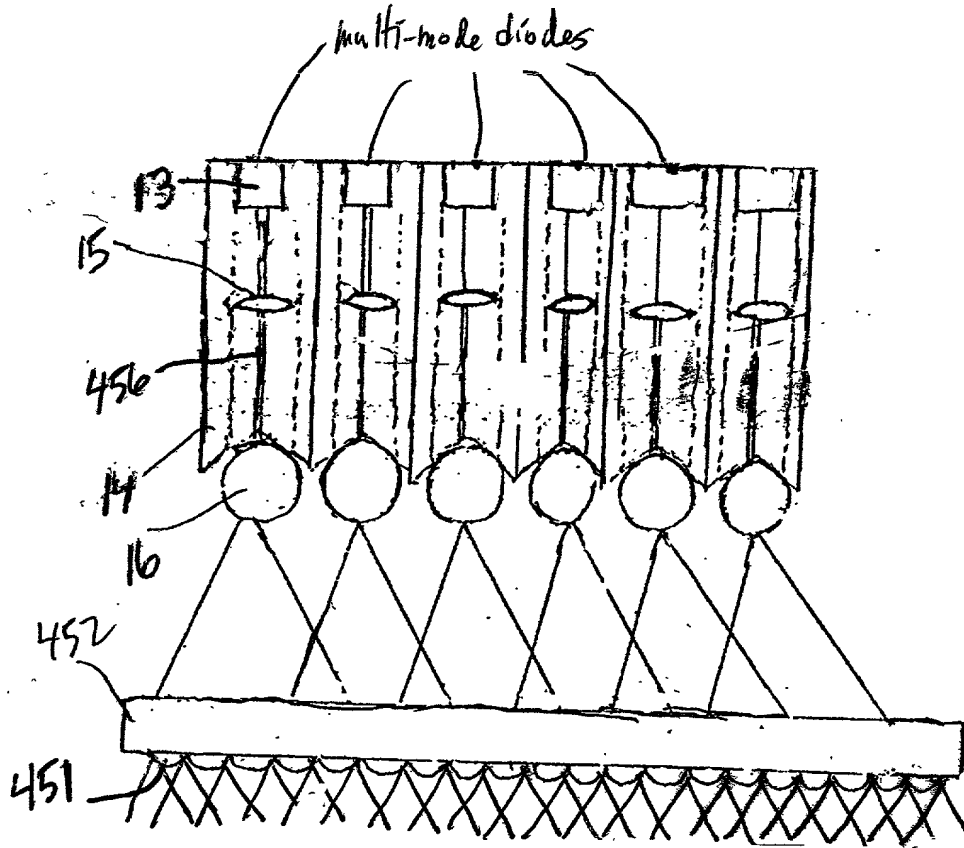


FIG 1I19C

FIFTH GENERALIZED METHOD
OF REDUCING SPECKLE-NOISE
PATTERNS AT IMAGE
DETECTION ARRAY OF THE
FFD SUBSYSTEM (3)

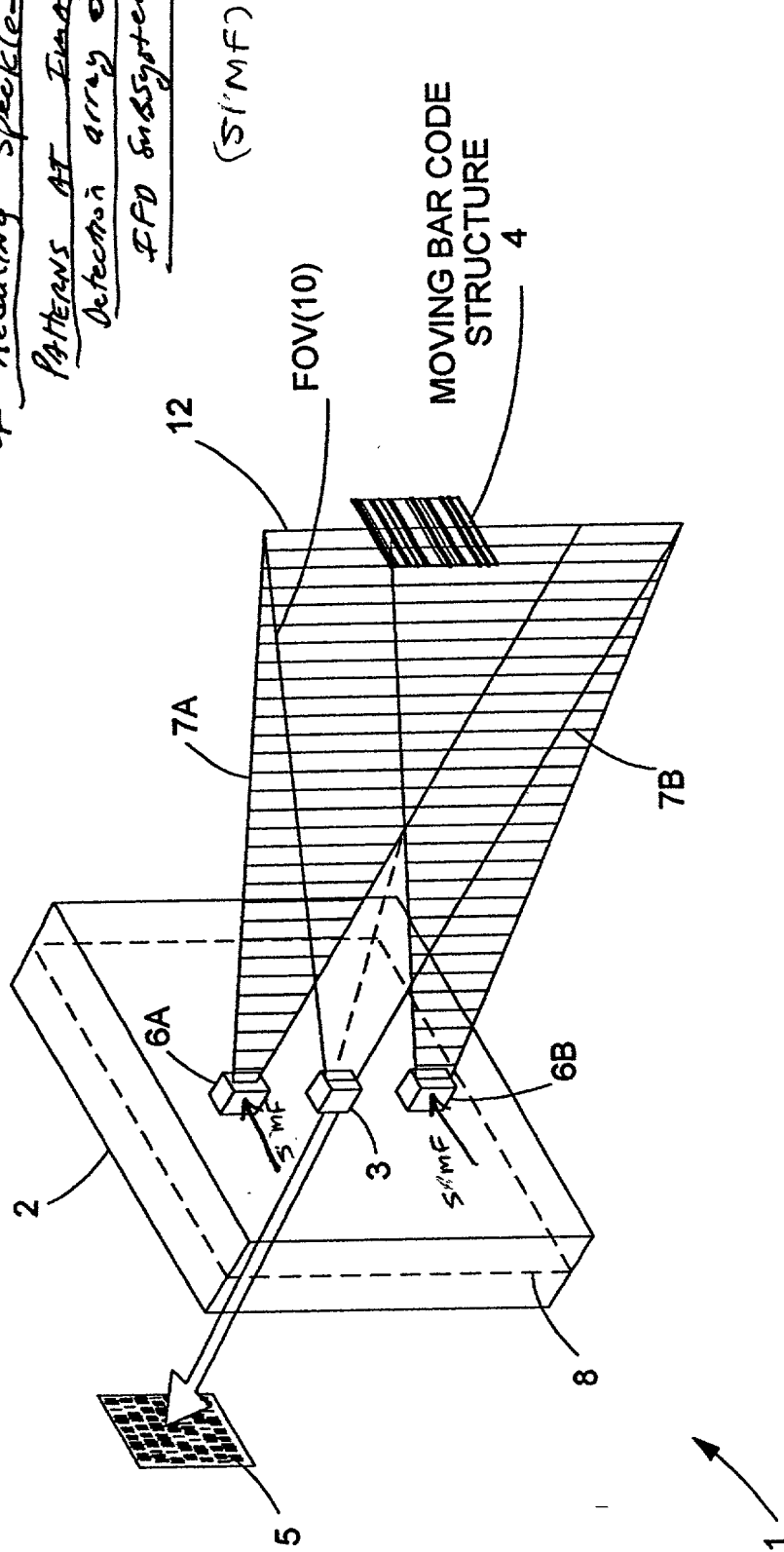
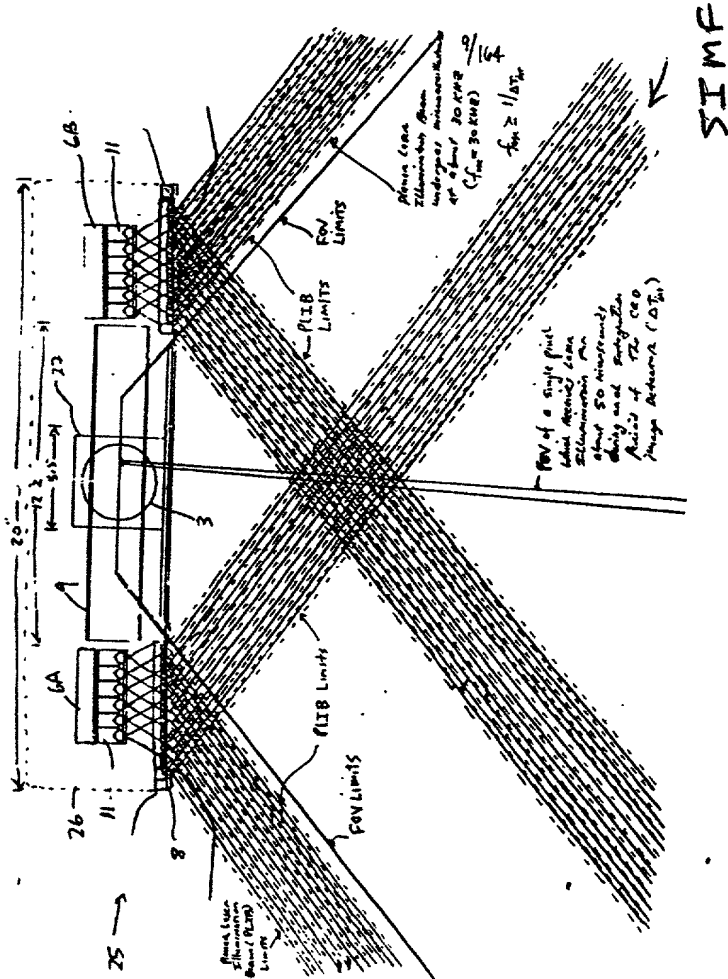


FIG 1F 20



Plan to object illumination

FIG. 1I 20A

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Fifth Generalized Speckle-Noise Pattern Reduction Method
Of The Present Invention

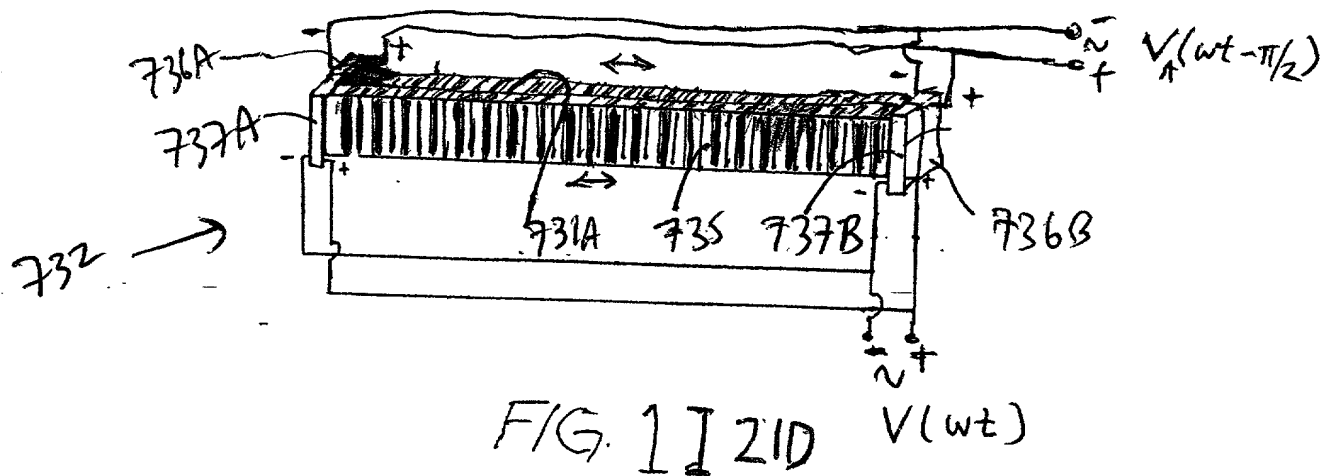
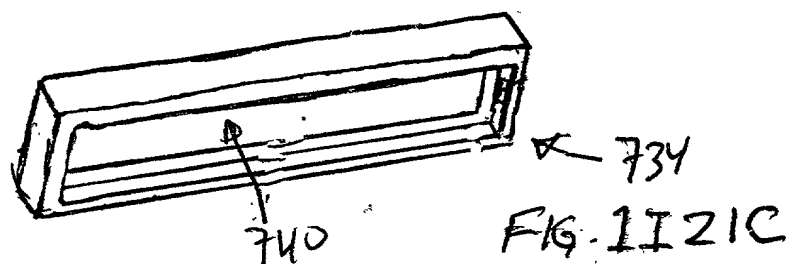
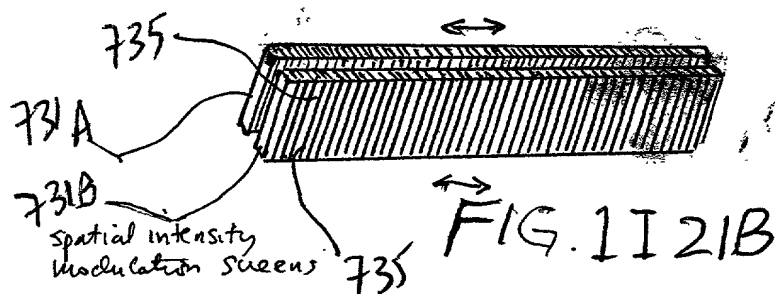
Prior to illumination of the target with the planar laser illumination beam (PLIB), modulate the spatial intensity of the transmitted PLIB along the planar extent thereof according to a spatial intensity modulation function (SIMF) so as to

produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

↓

Temporally average the numerous substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce power of the speckle-noise pattern observed at the image detection array.

FIG. 1I20B



Generalized Method of
Reducing Speckle-Noise Patterns
at Image Detection array
of the IFD Subsystem

(SIMF)

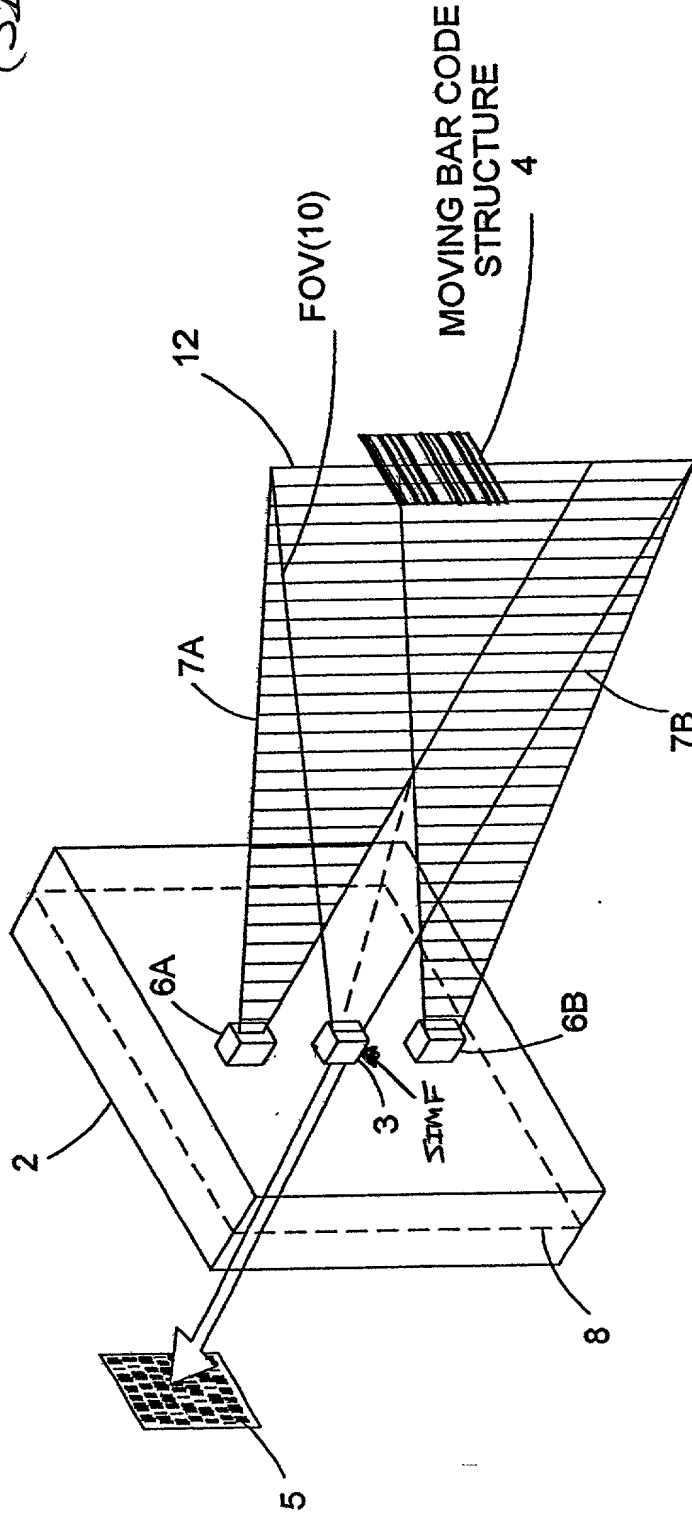


FIG. 1I 22

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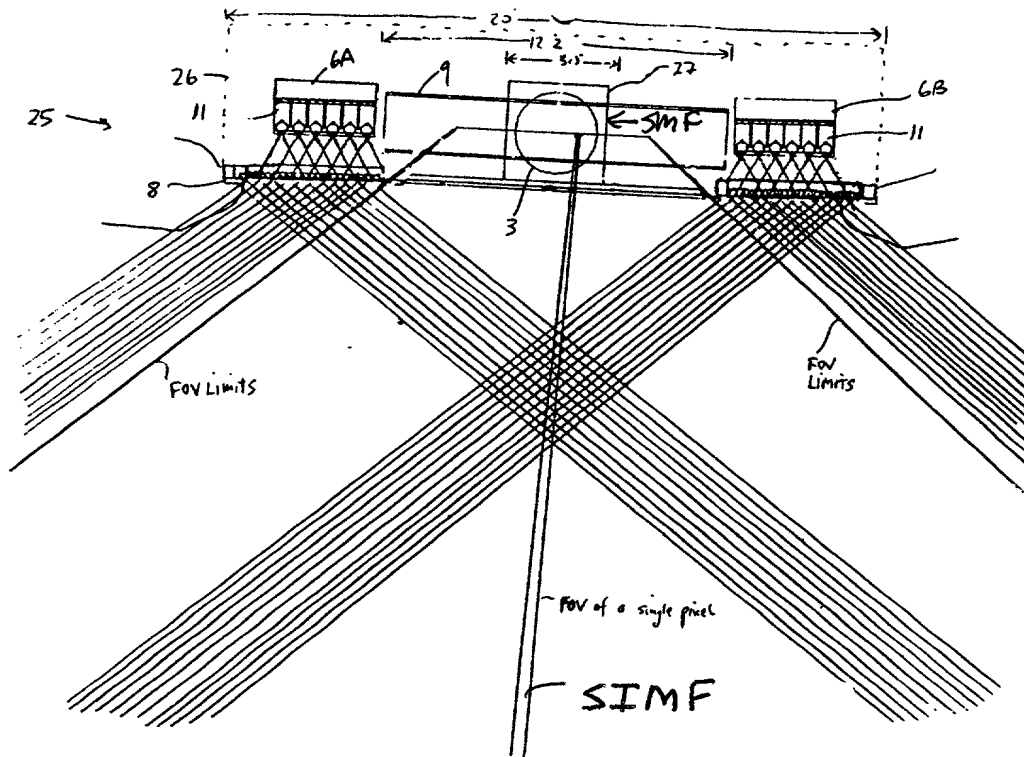


FIG. 1I 22A

Sixth Generalized Speckle-Noise Pattern Reduction Method
Of The Present Invention

After illumination of the target with the planar laser illumination beam (PLIB), modulate the spatial intensity of the reflected/scattered (i.e. received) PLIB along the planar extent thereof according to a spatial intensity modulation function (SIMF) so as to .

produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

Temporally average the many substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce the speckle-noise pattern observed at the image detection array.

FIG. 1I 22B

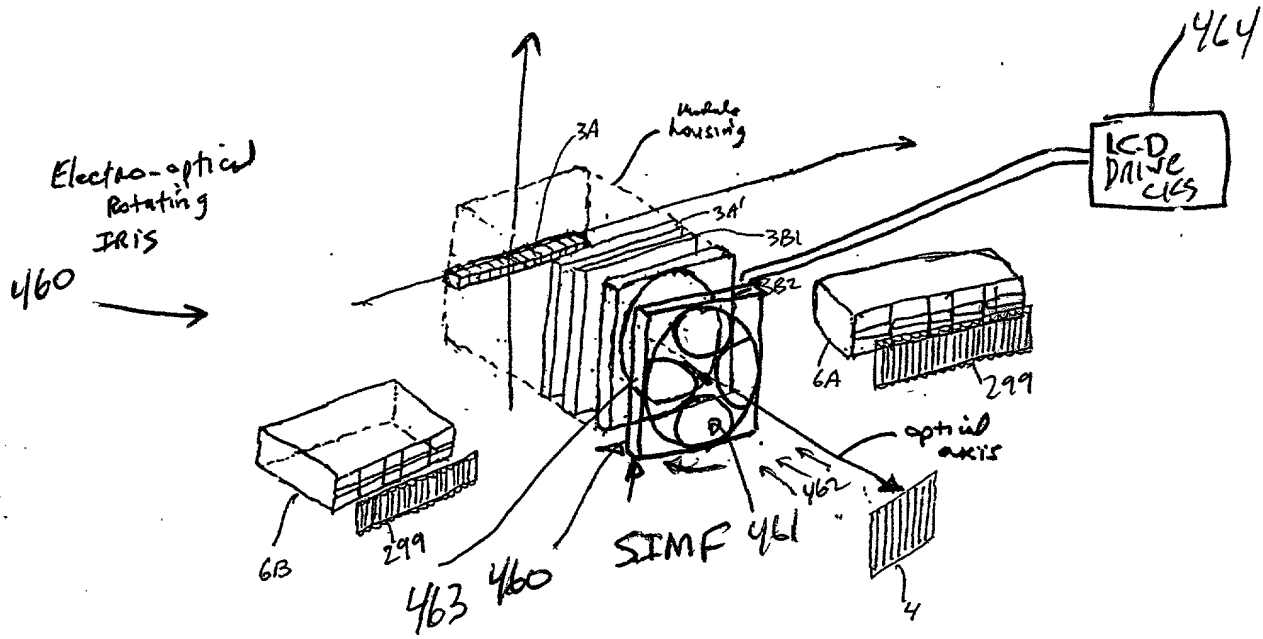


FIG. 1I 23A

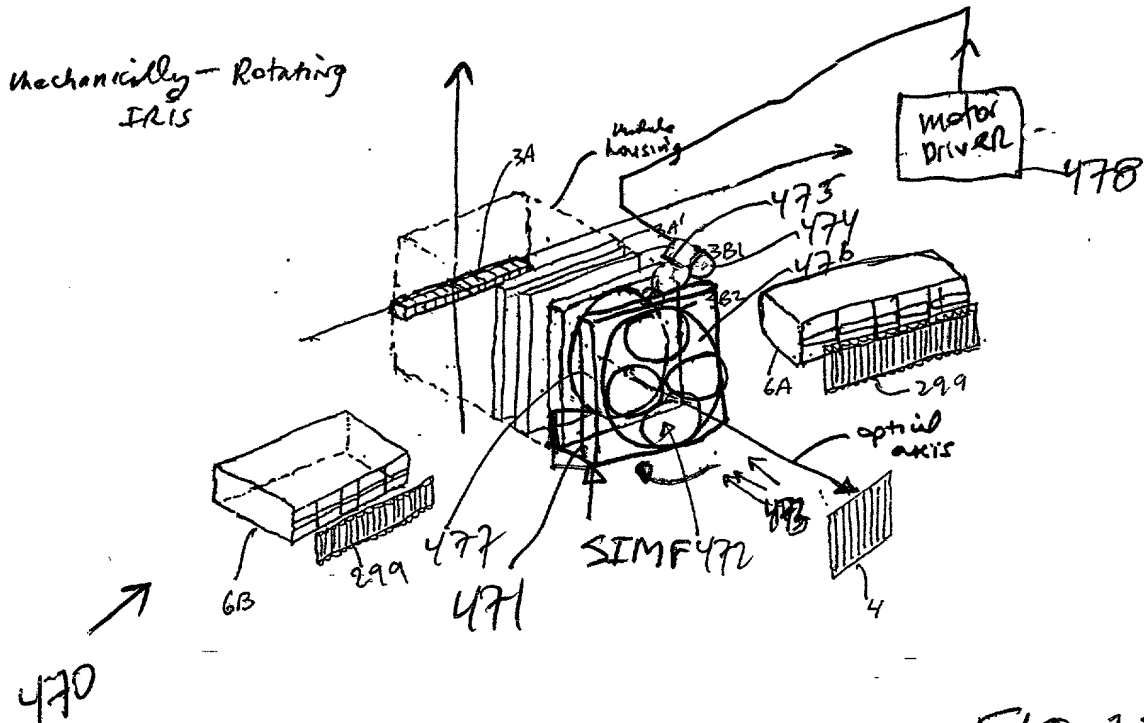


FIG. 1I 23B

Seventh Generalized Method of
Reducing Speckle-Noise Patterns
at Image Detection Array
of IR IFD Subsystem

(TIME)

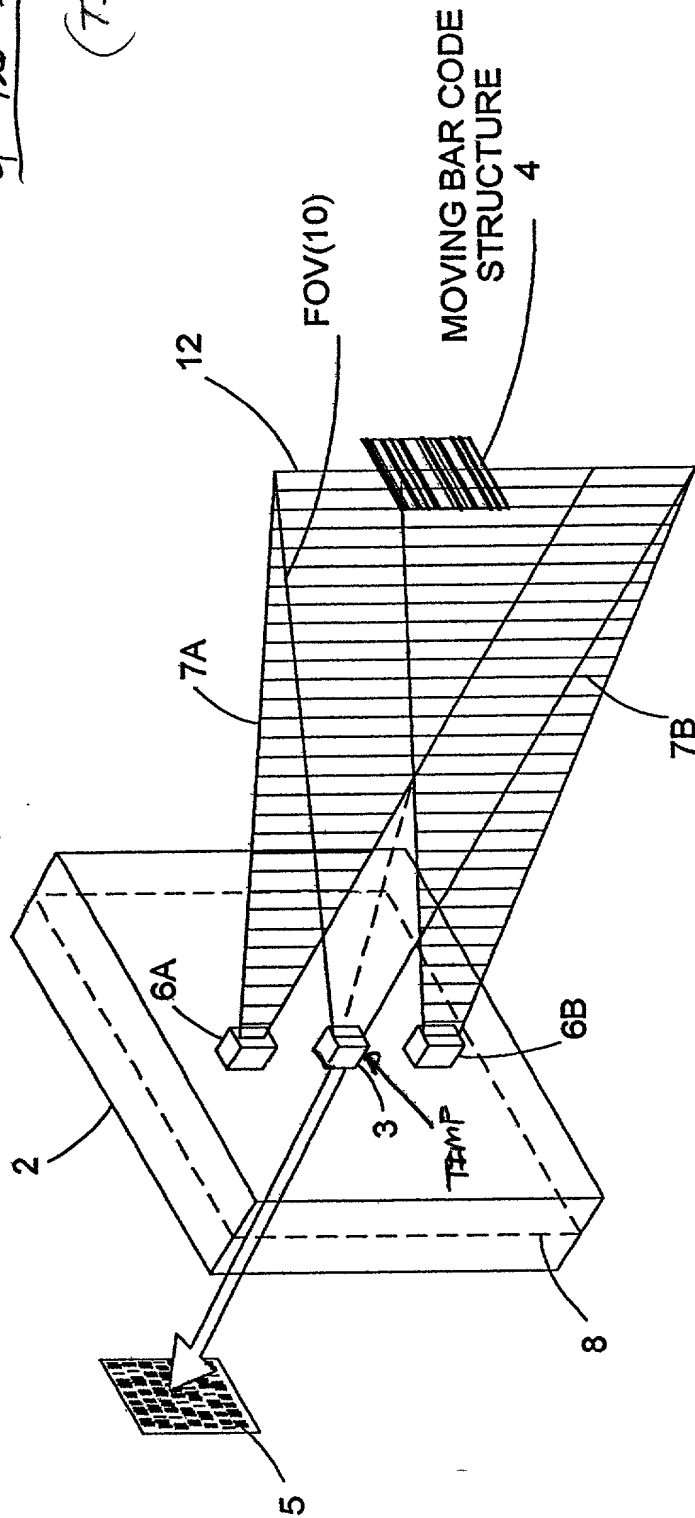


FIG. 1124

Wormholes



FIG. 1I 24A

Seventh Generalized Speckle-Noise Pattern Reduction Method
Of The Present Invention

After illumination of the target with the planar laser illumination beam (PLIB), modulate the temporal intensity of the reflected/scattered (i.e. received) PLIB along the planar extent thereof according to a temporal intensity modulation function (TIMF) so as to

produce many substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

Temporally average the many substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce the speckle-noise pattern observed at the image detection array.

FIG. 1I 24B

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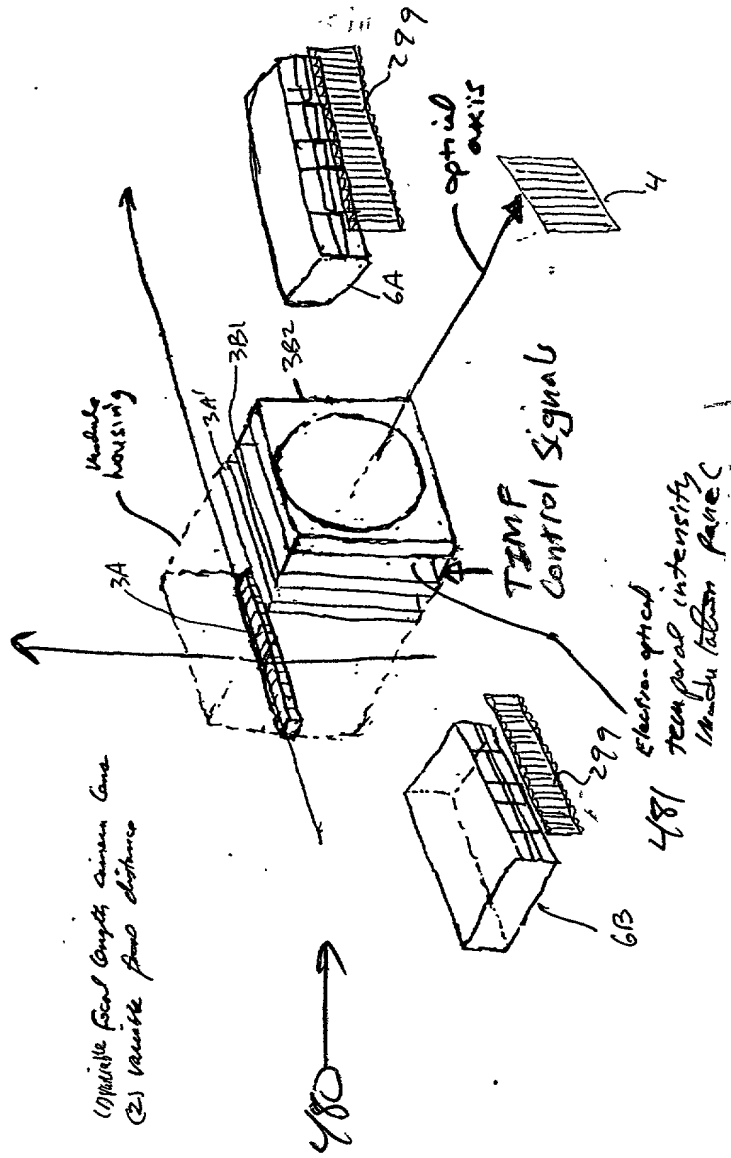
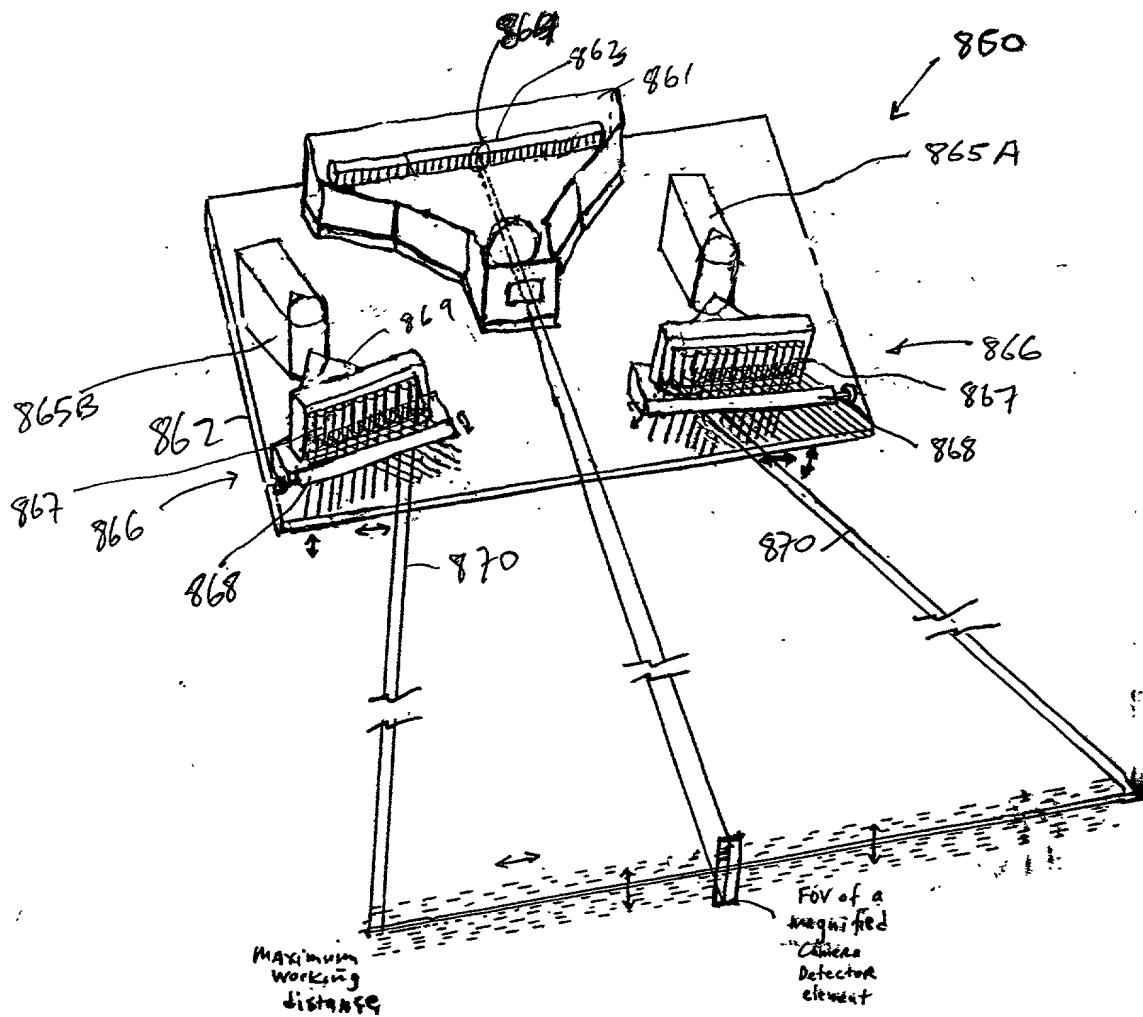


FIG. 1I 24C

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* Lateral and Transverse Microoscillation of PLIB

FIG. 1I25A1

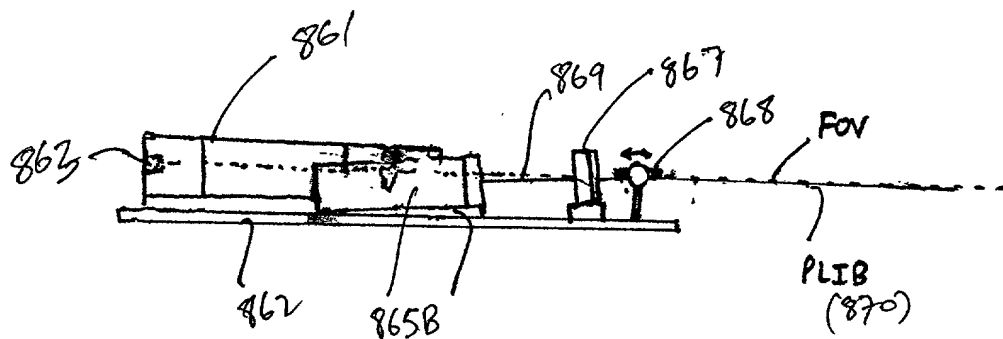


FIG. 1I25A2

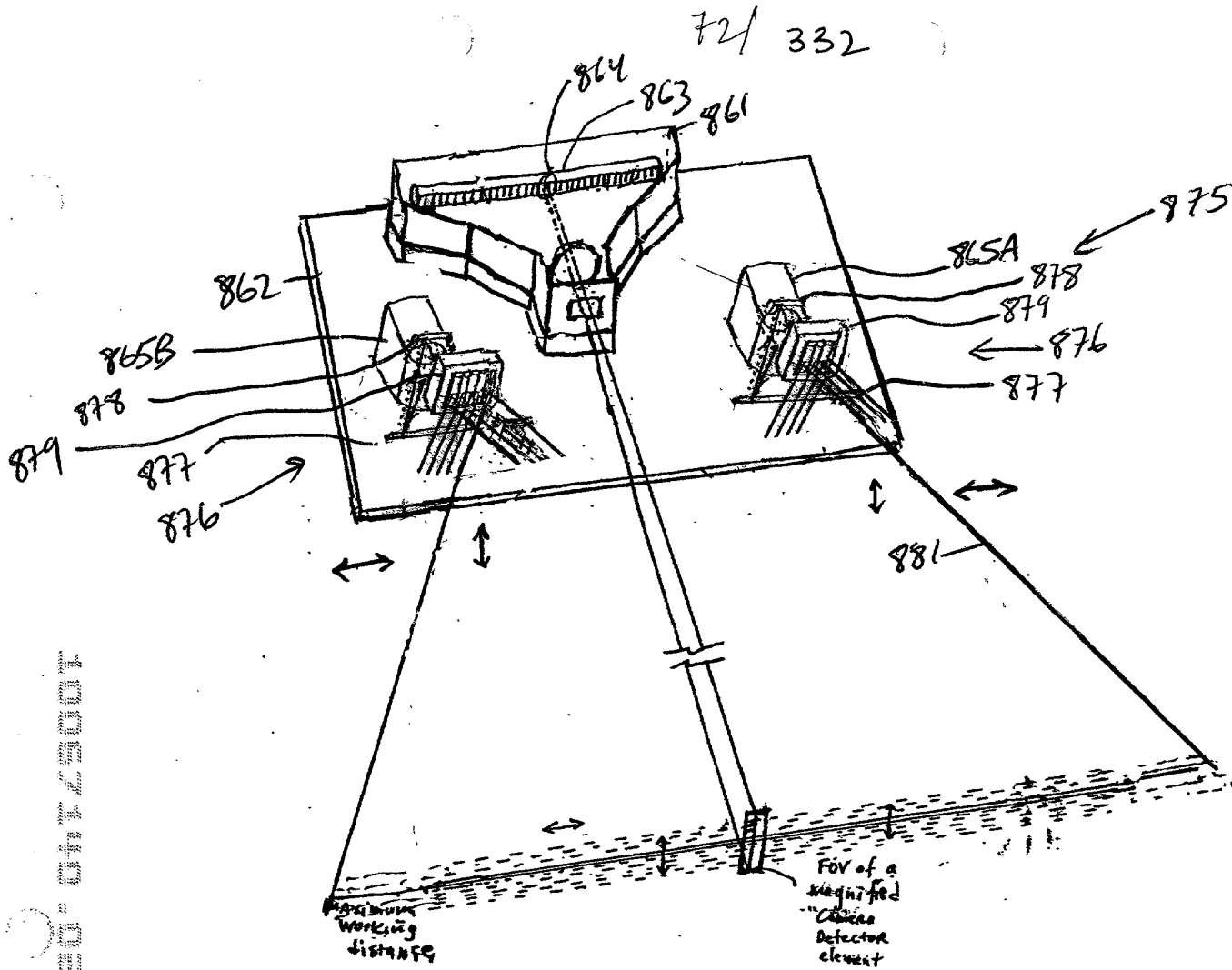


FIG. 1I25B1

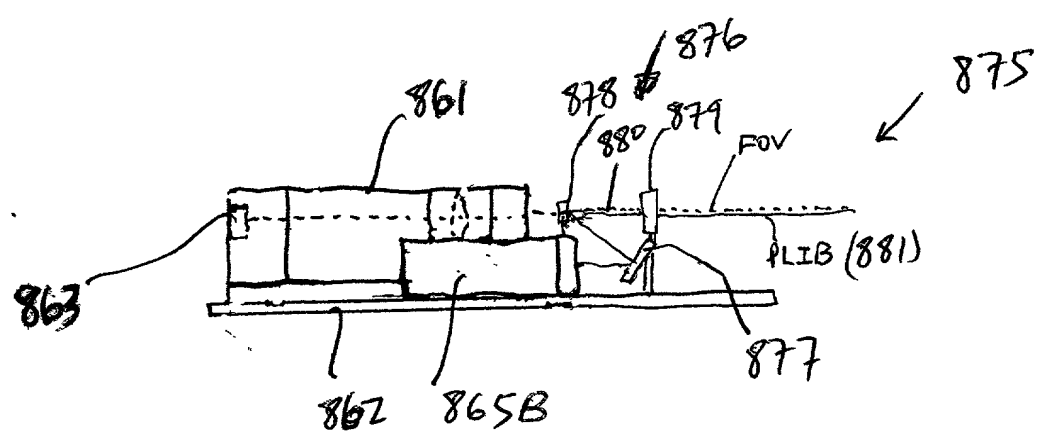
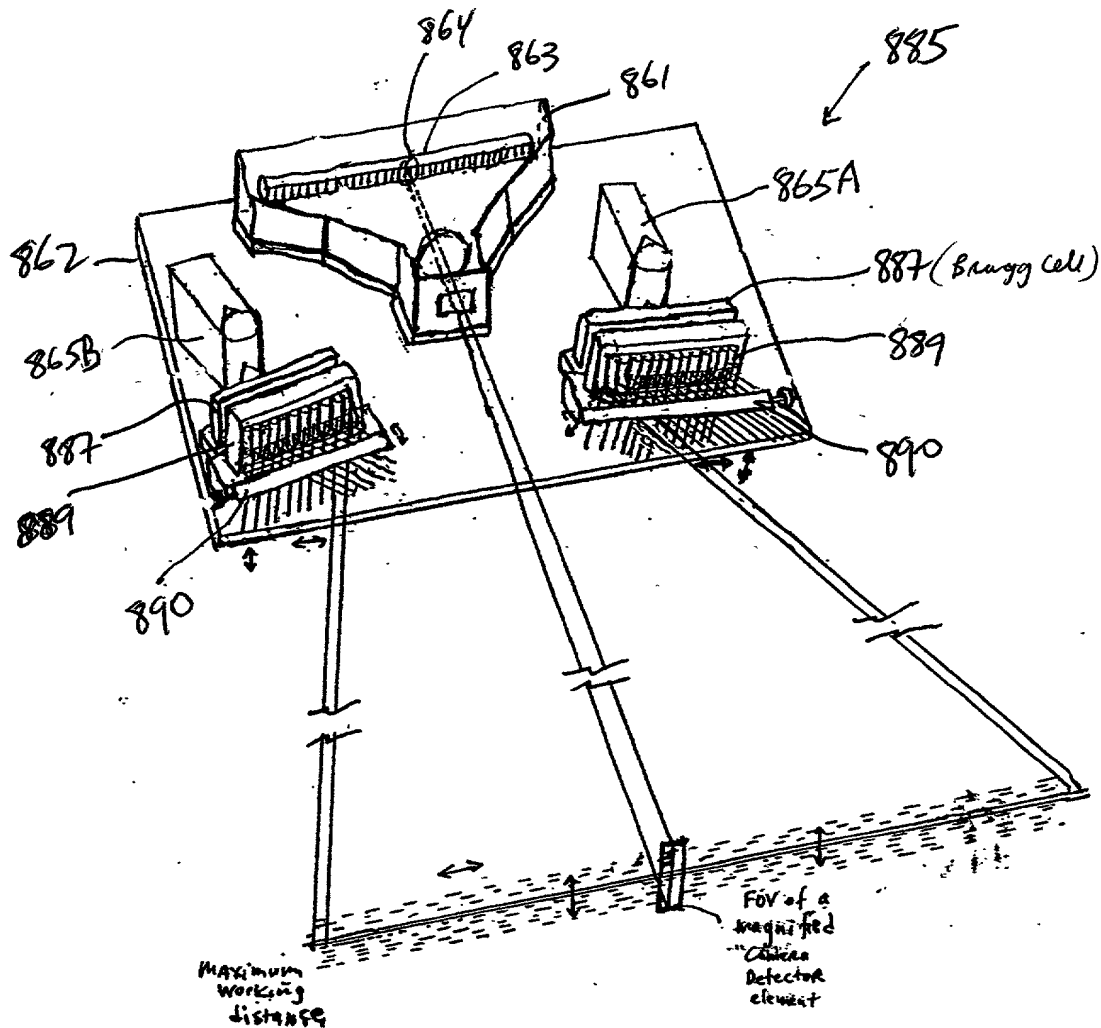


FIG. 1I25B2



* Lateral and Transverse Microoscillation of PLIB

FIG. 1I25C1

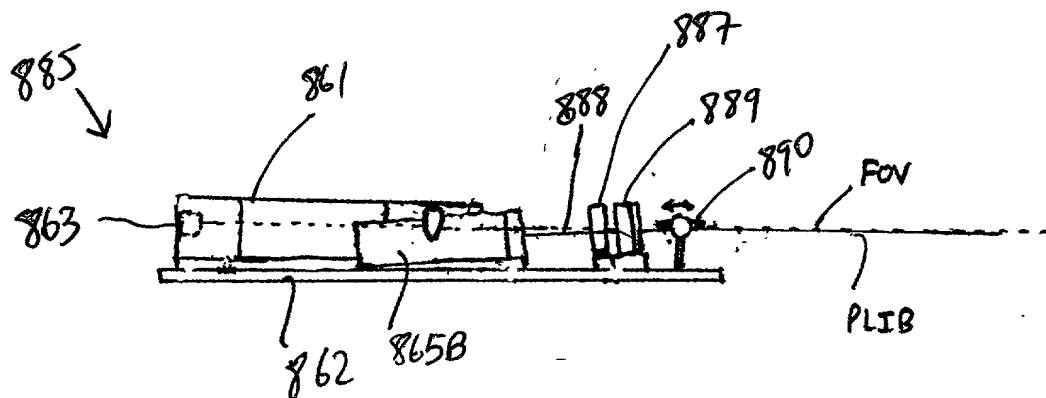
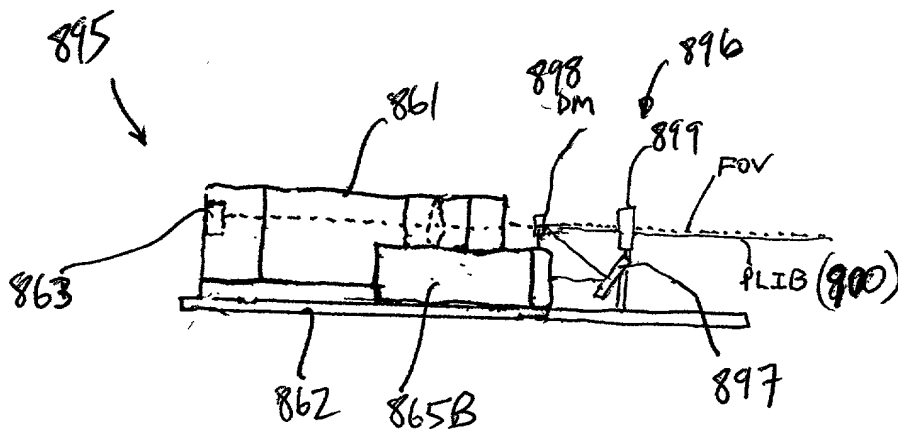
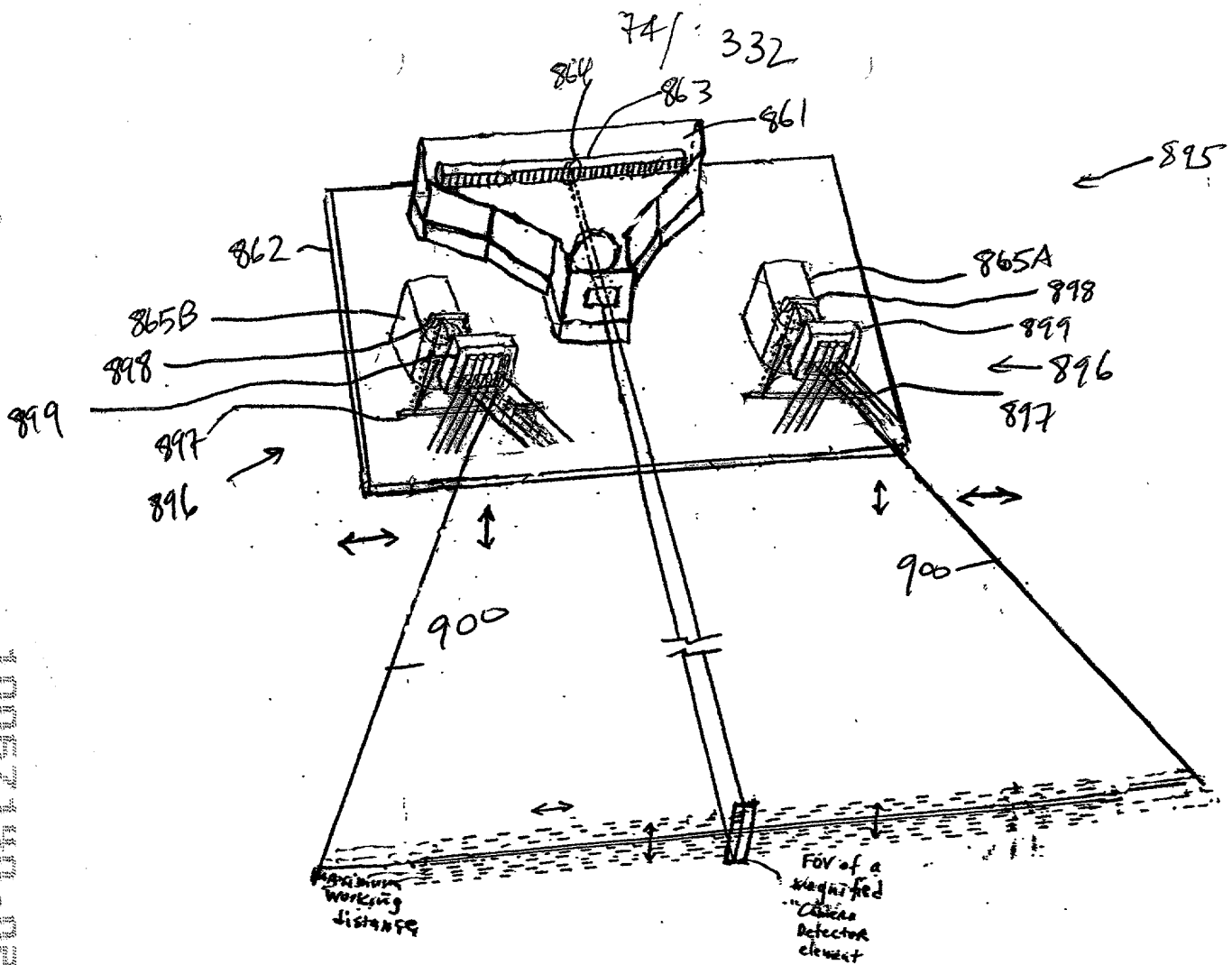
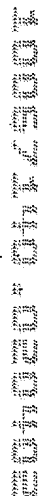


FIG. 1I25C2





- * Lateral and Transverse Micromassivation of PLIB

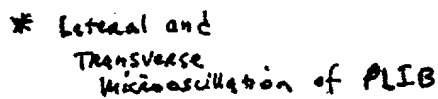
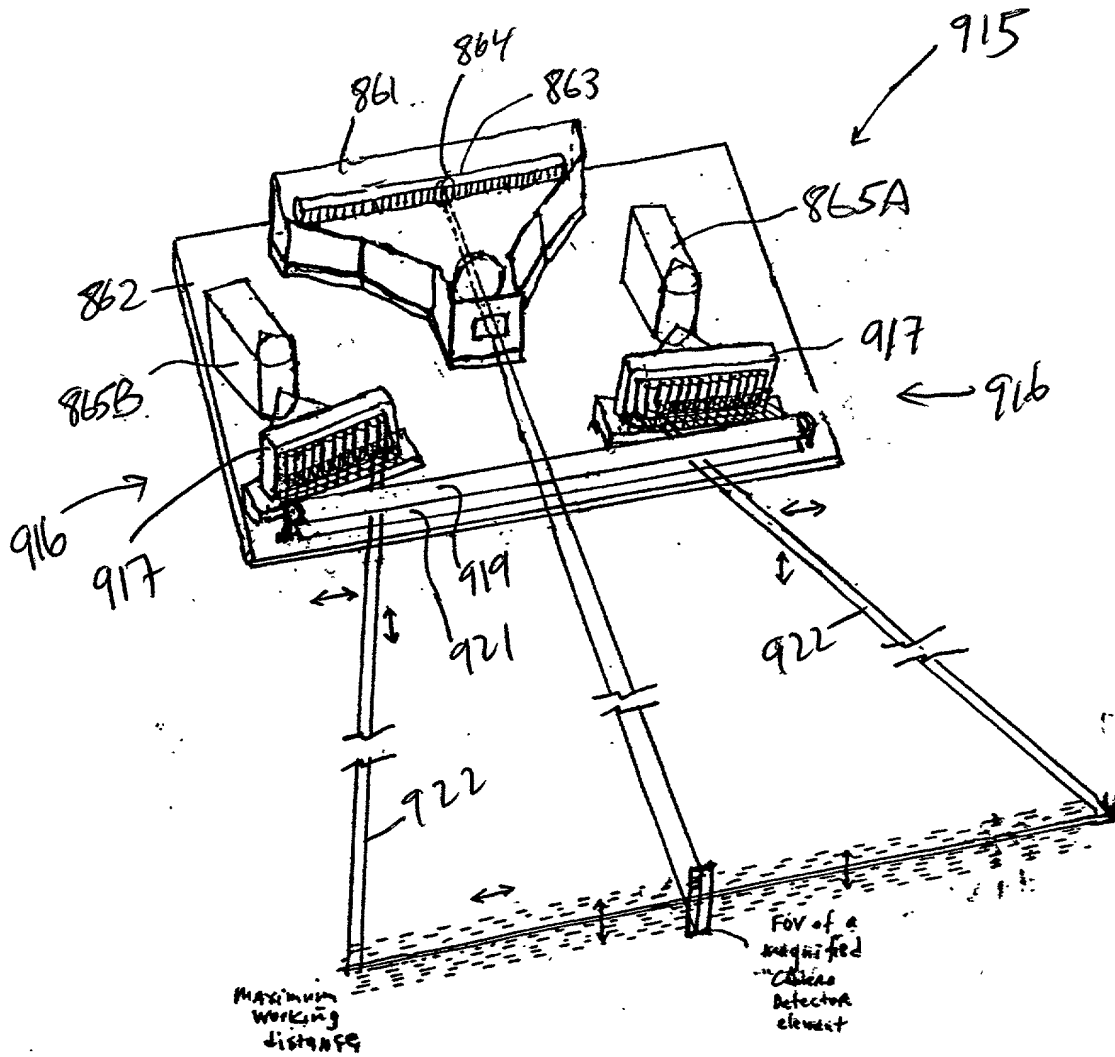


FIG. 1I25E2

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* Lateral and Transverse Misalignment of PLB

FIG. 1I25F1

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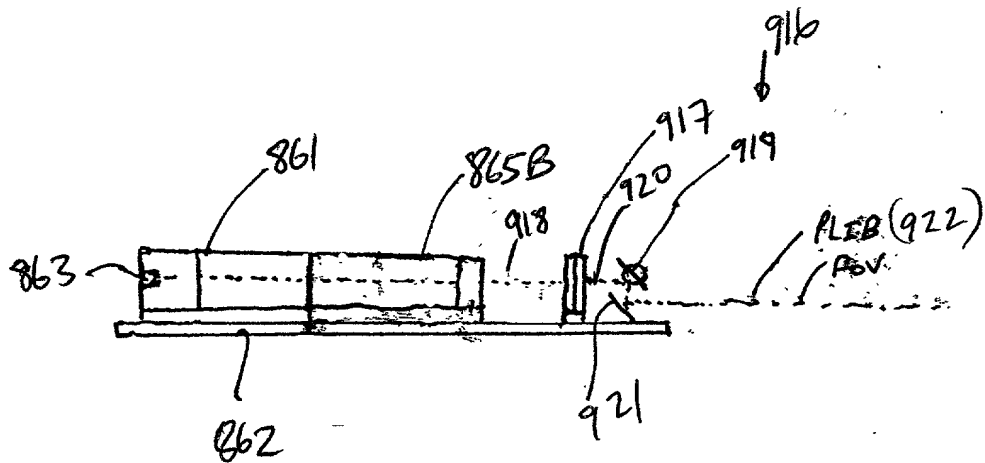
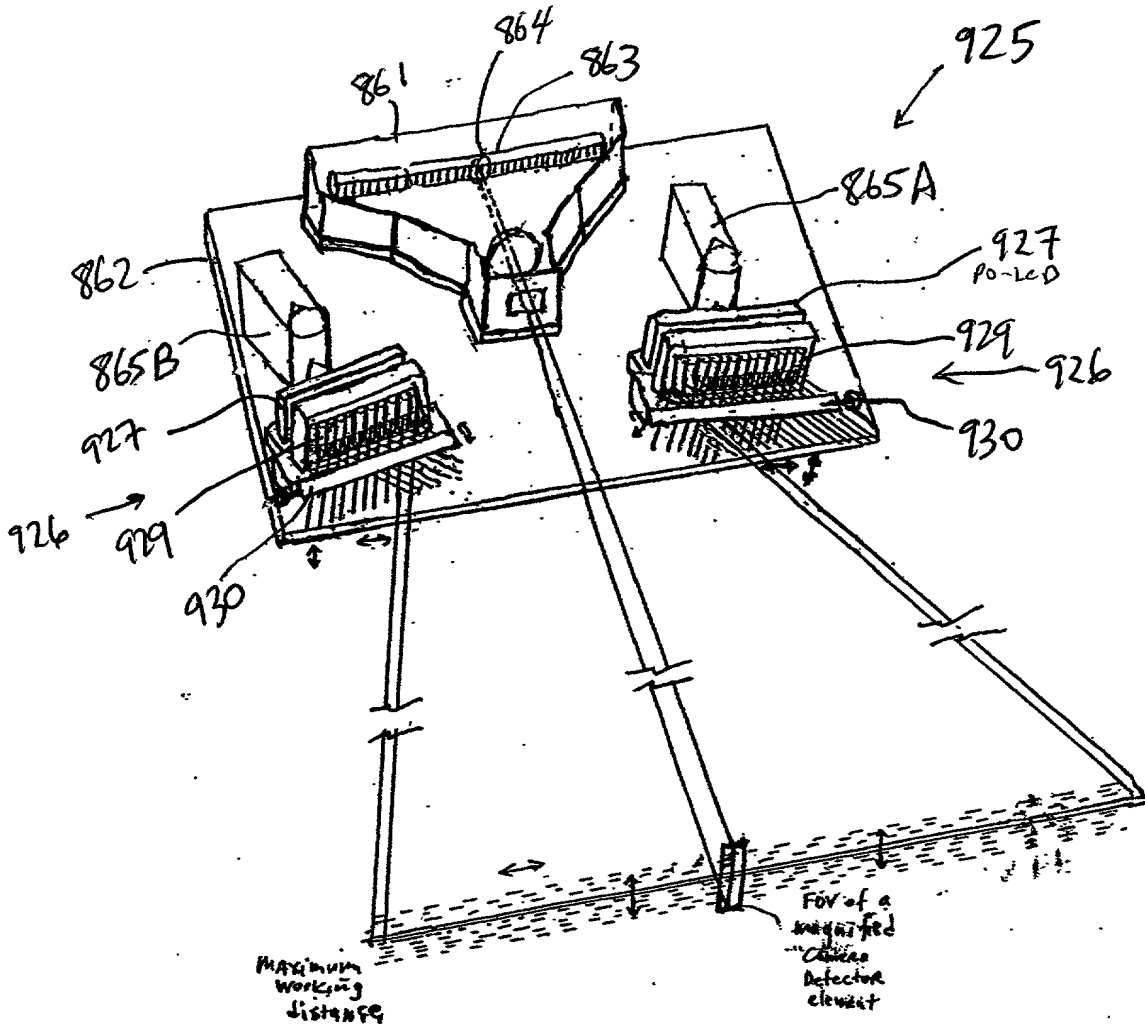


FIG. 1I25F2

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* Lateral and Transverse Microoscillation of PLIB

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FIG. 1I25G1

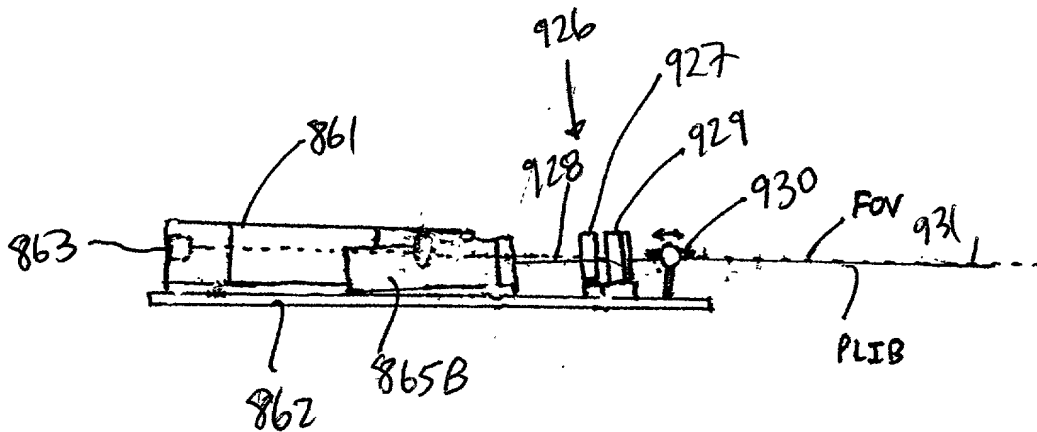
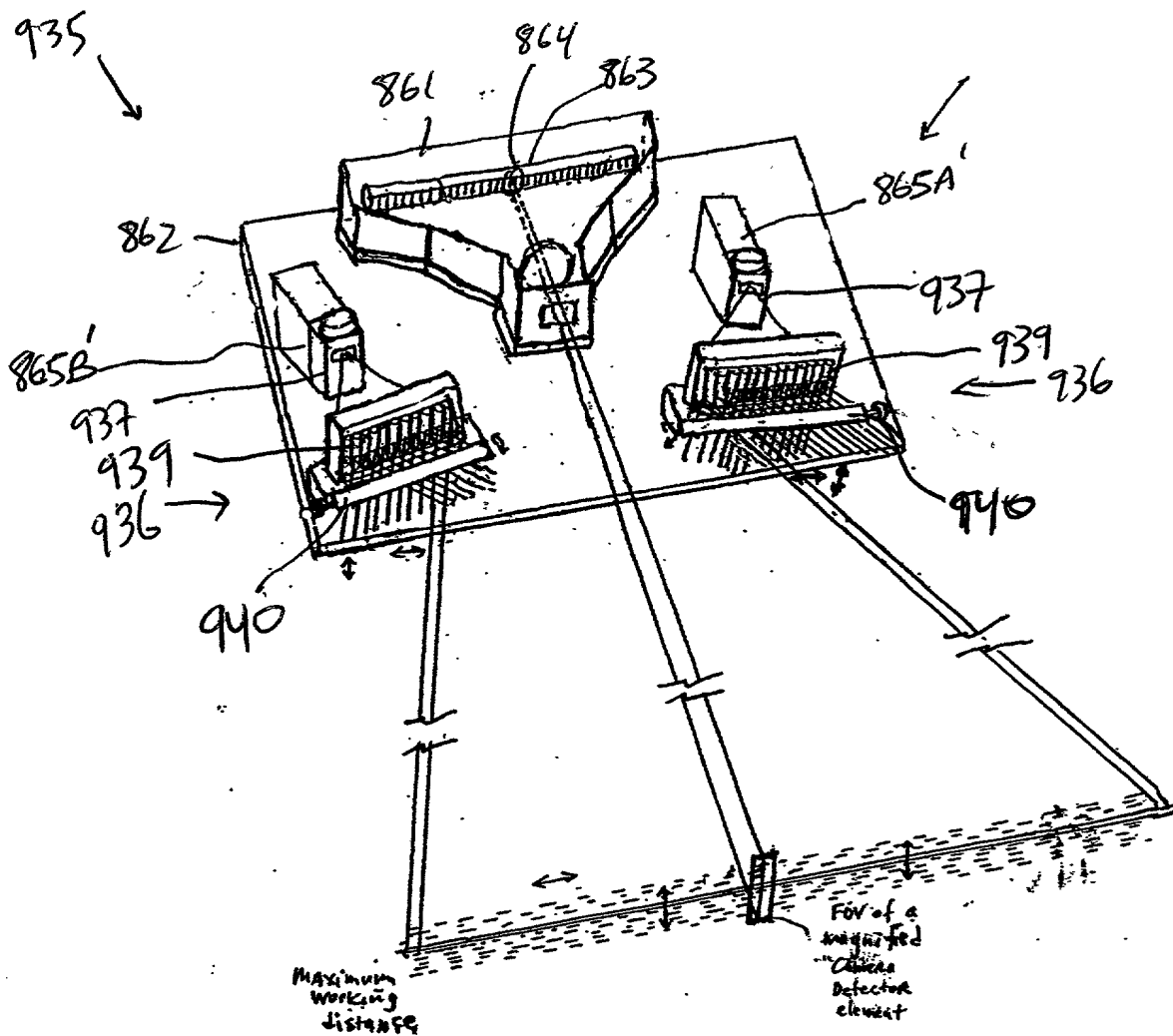


FIG. 1I25G2

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* Lateral and Transverse Microoscillation of PLIB

FIG. 1I25 H1

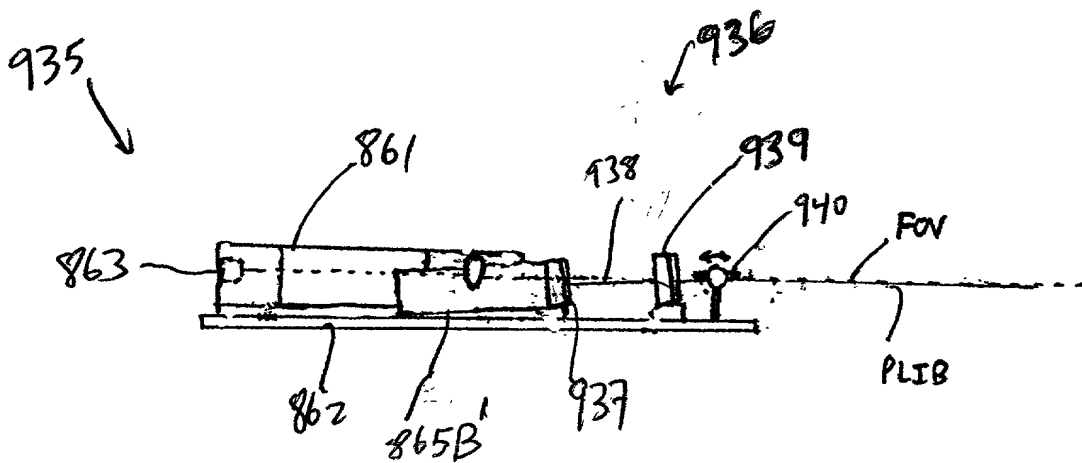
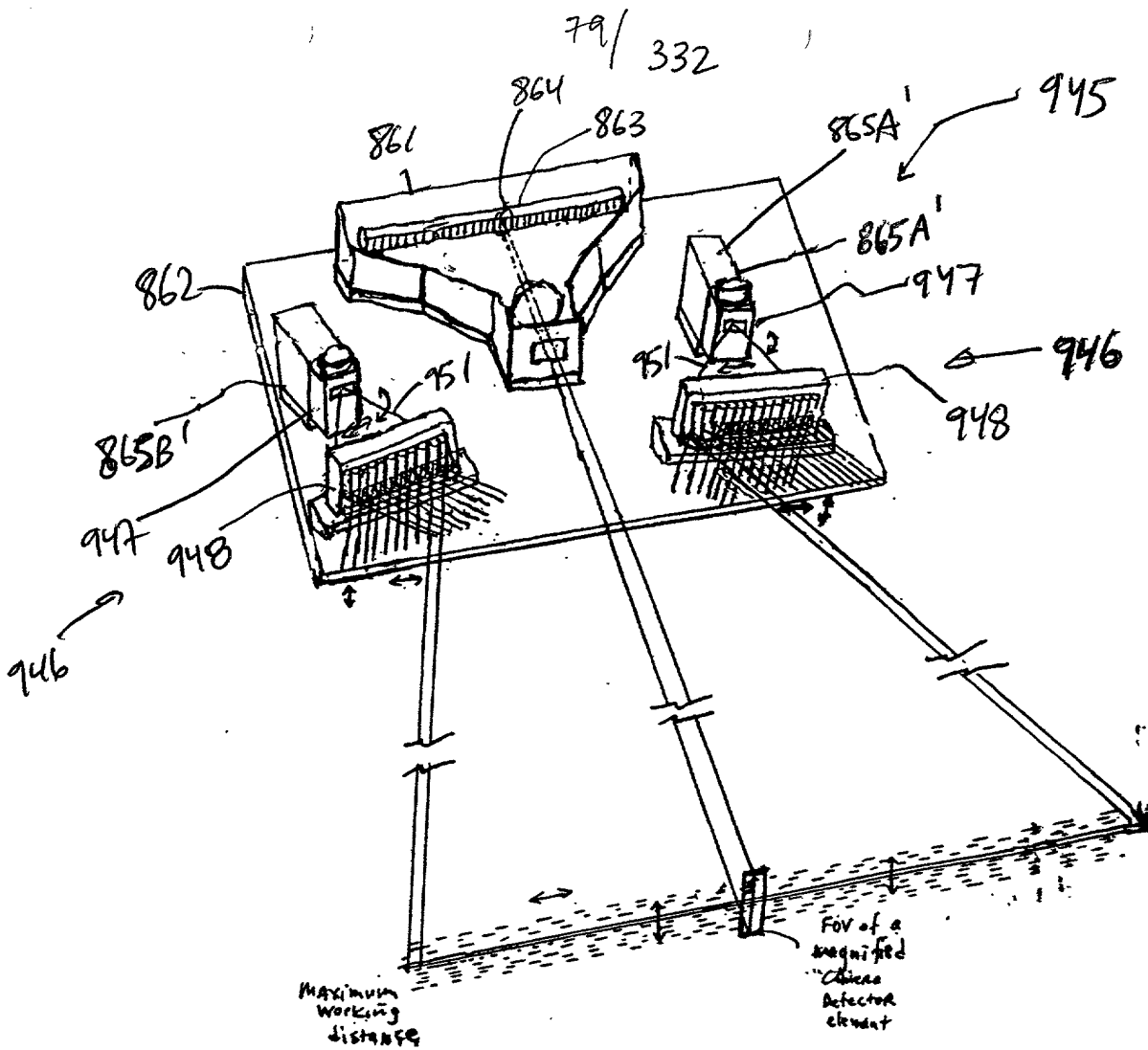


FIG. 1I25 H2



Lateral and Transverse
Microoscillation of PLIB

FIG. 1I25I1

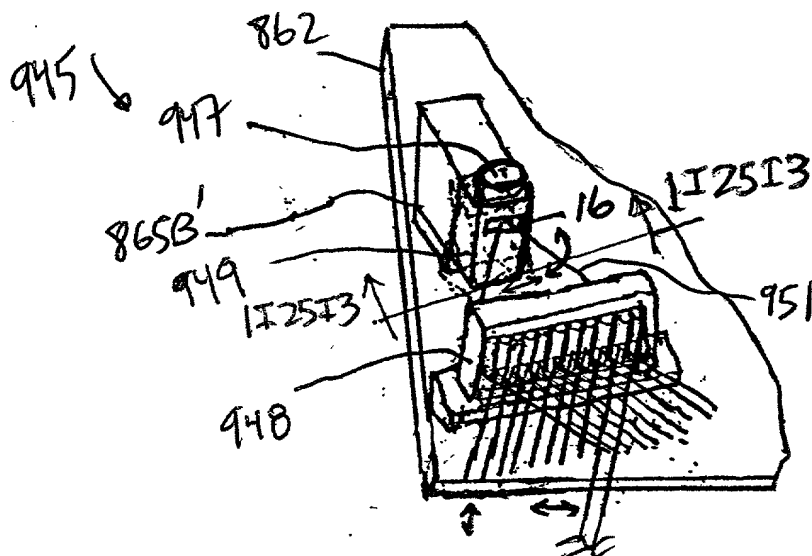


FIG. 1I25I2

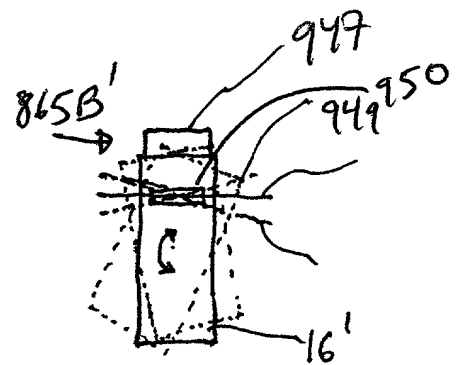


FIG. 1I25I3

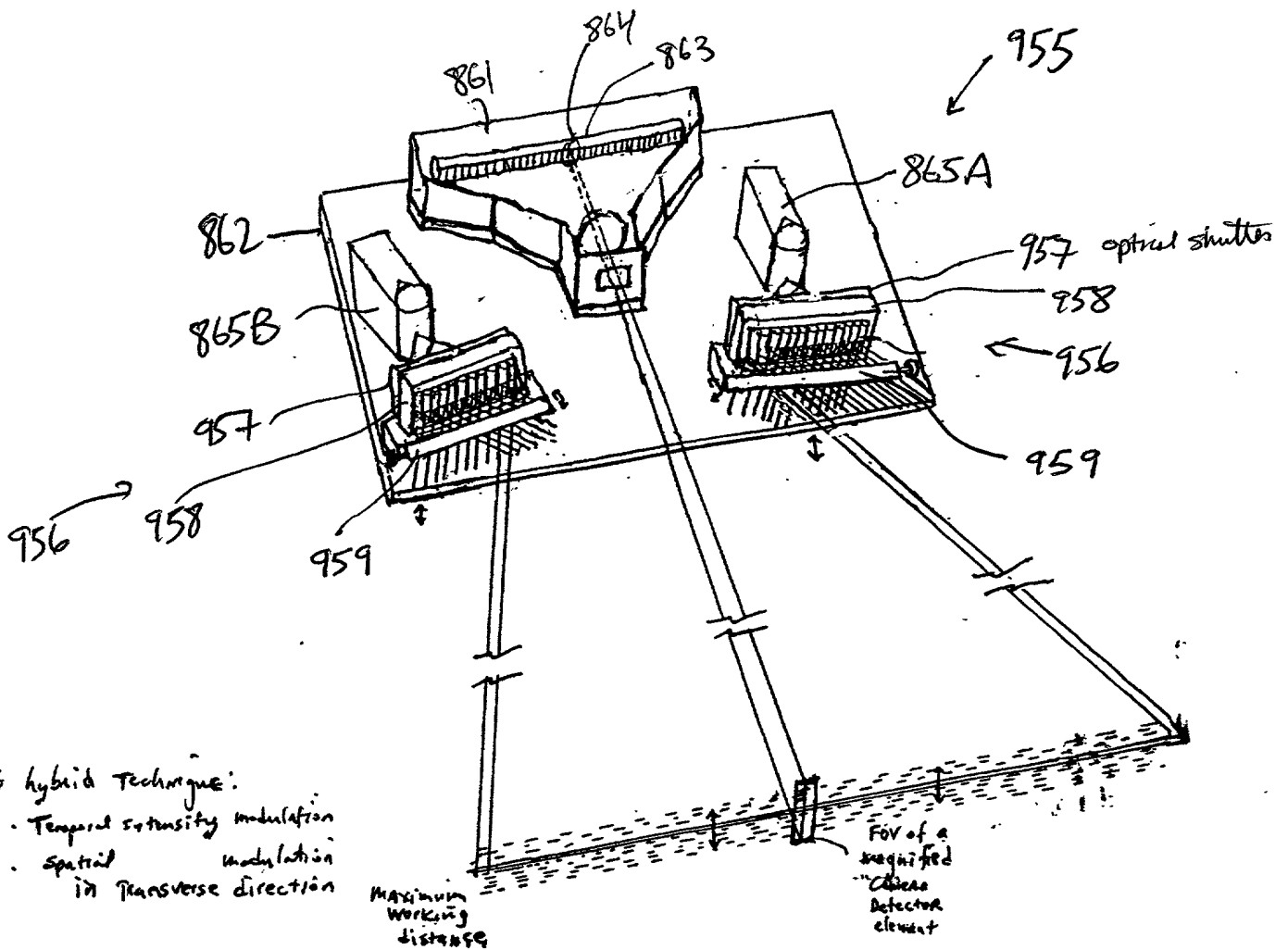


FIG. 1I25J1

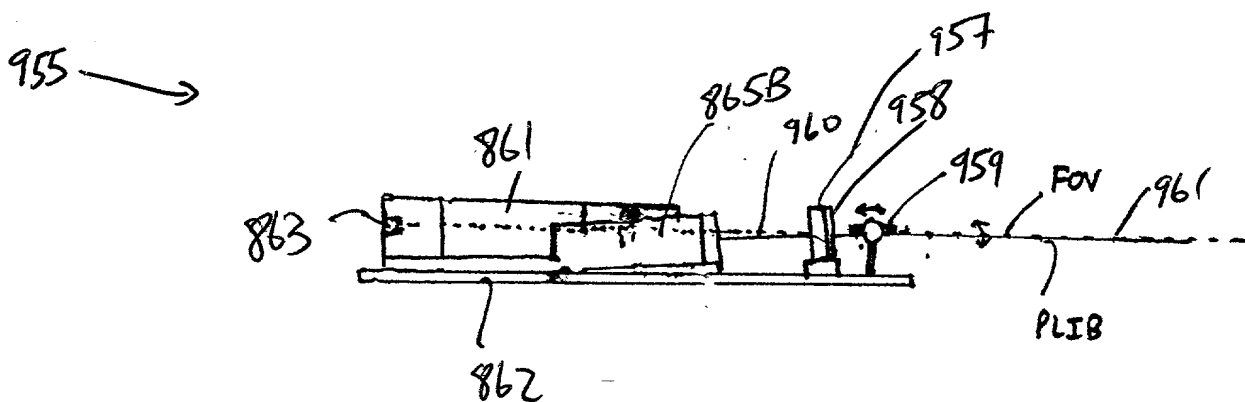
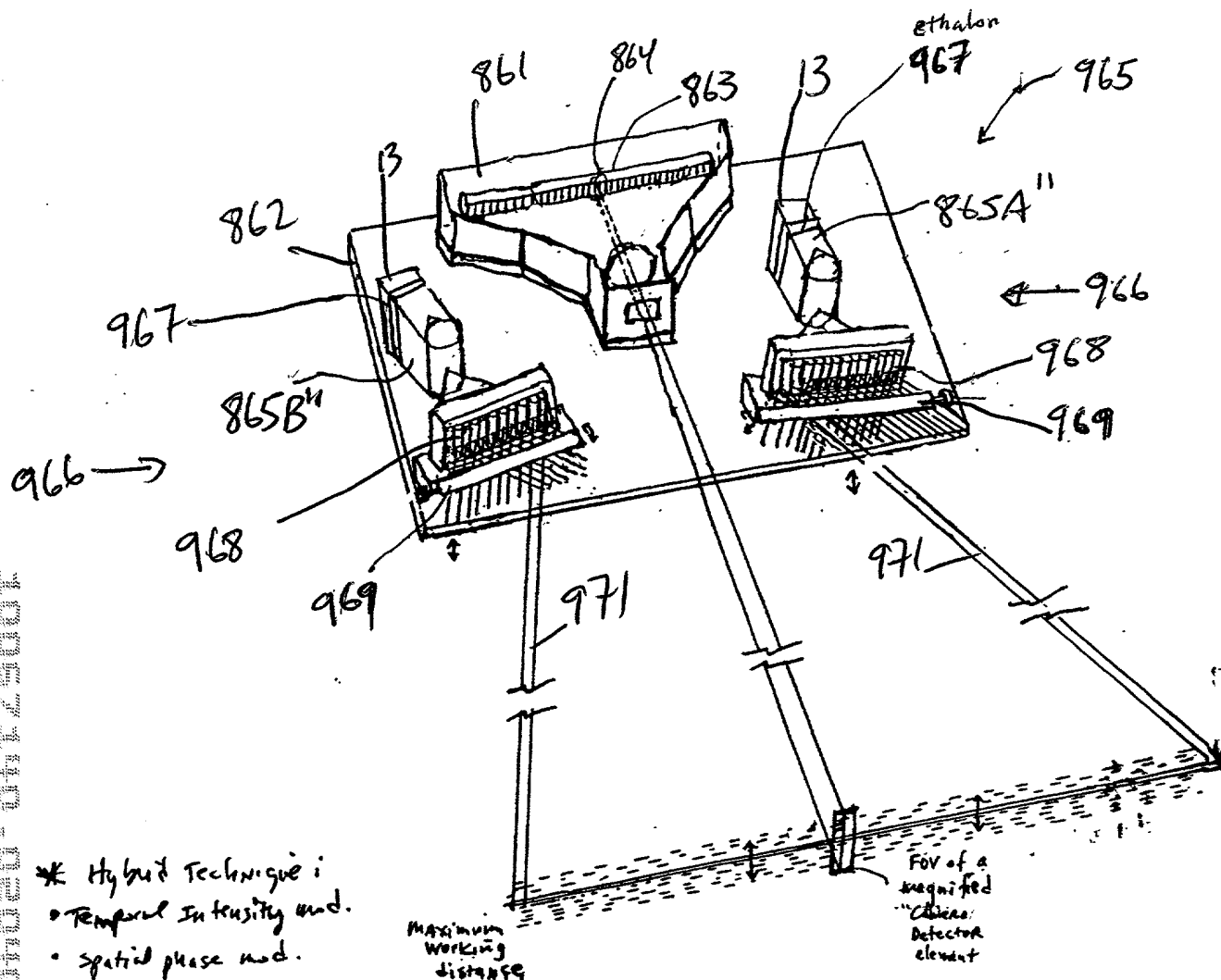


FIG. 1I25J2

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* Hybrid Technique i
 • Temporal Intensity mod.
 • Spatial phase mod.

FIG. 1I25K1

* Transverse
 Microillumination of PLIB

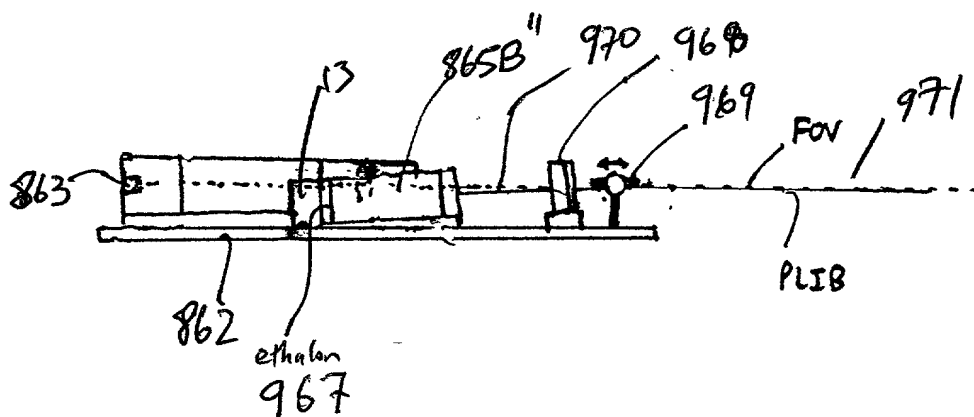
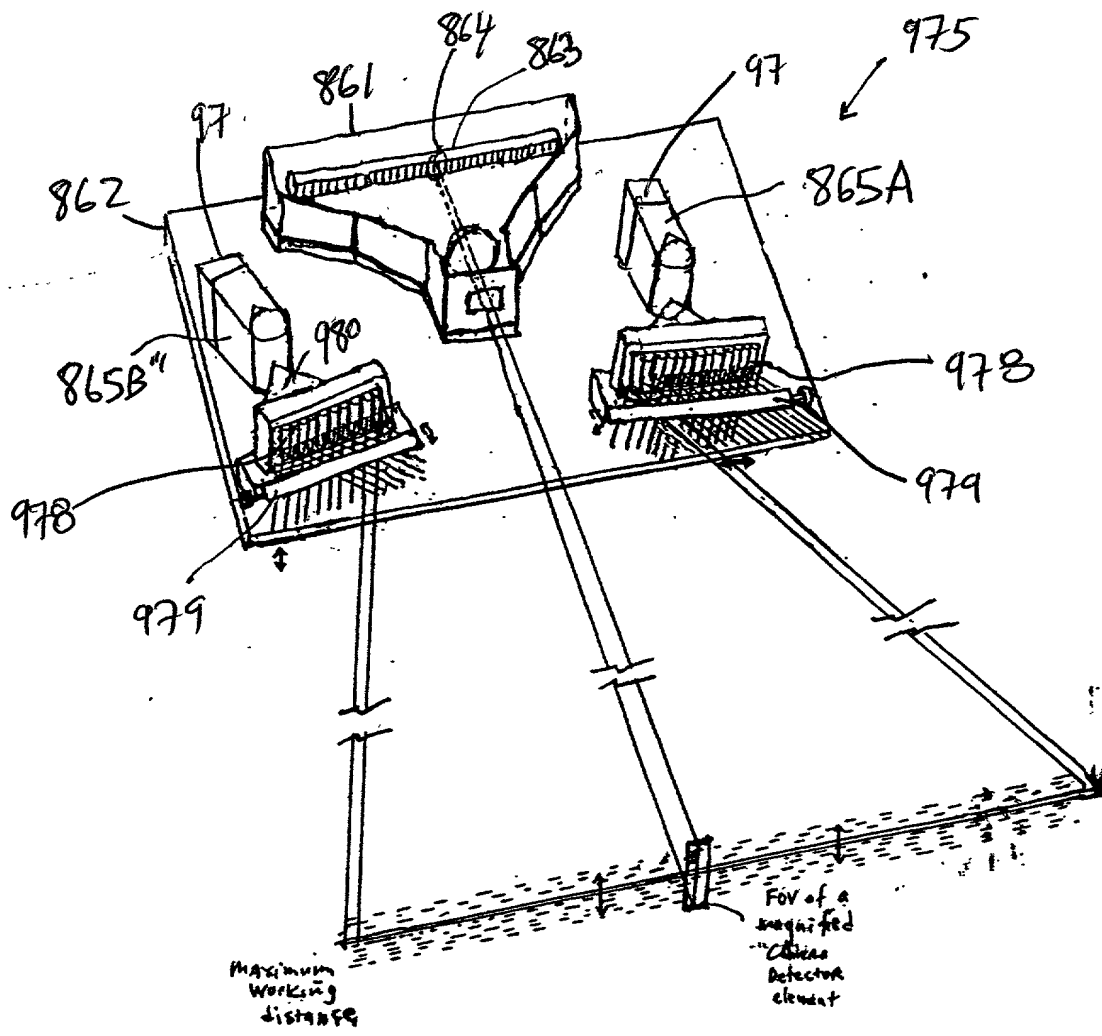


FIG. 1I25K2



- * hybrid =
 - Temp. freq. mod.
 - spatial phase mod.
- * Transverse
Microoscillation of PLIB

FIG. 1I25L1

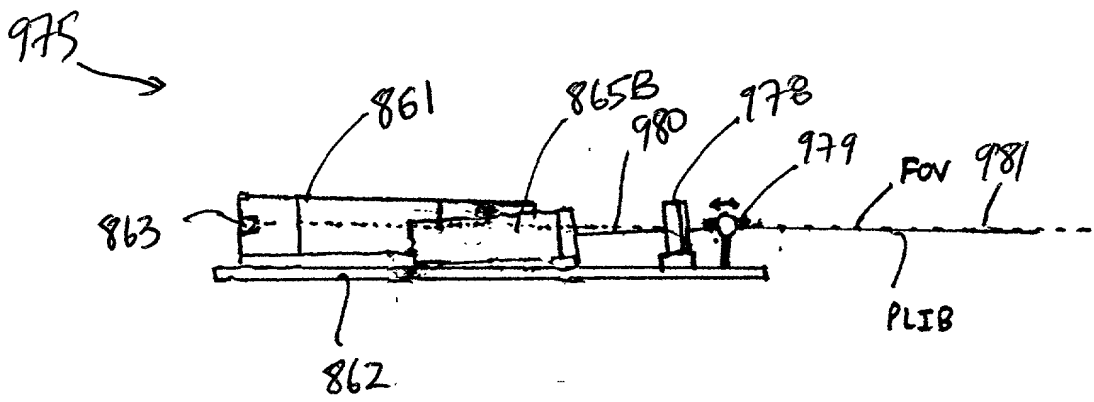
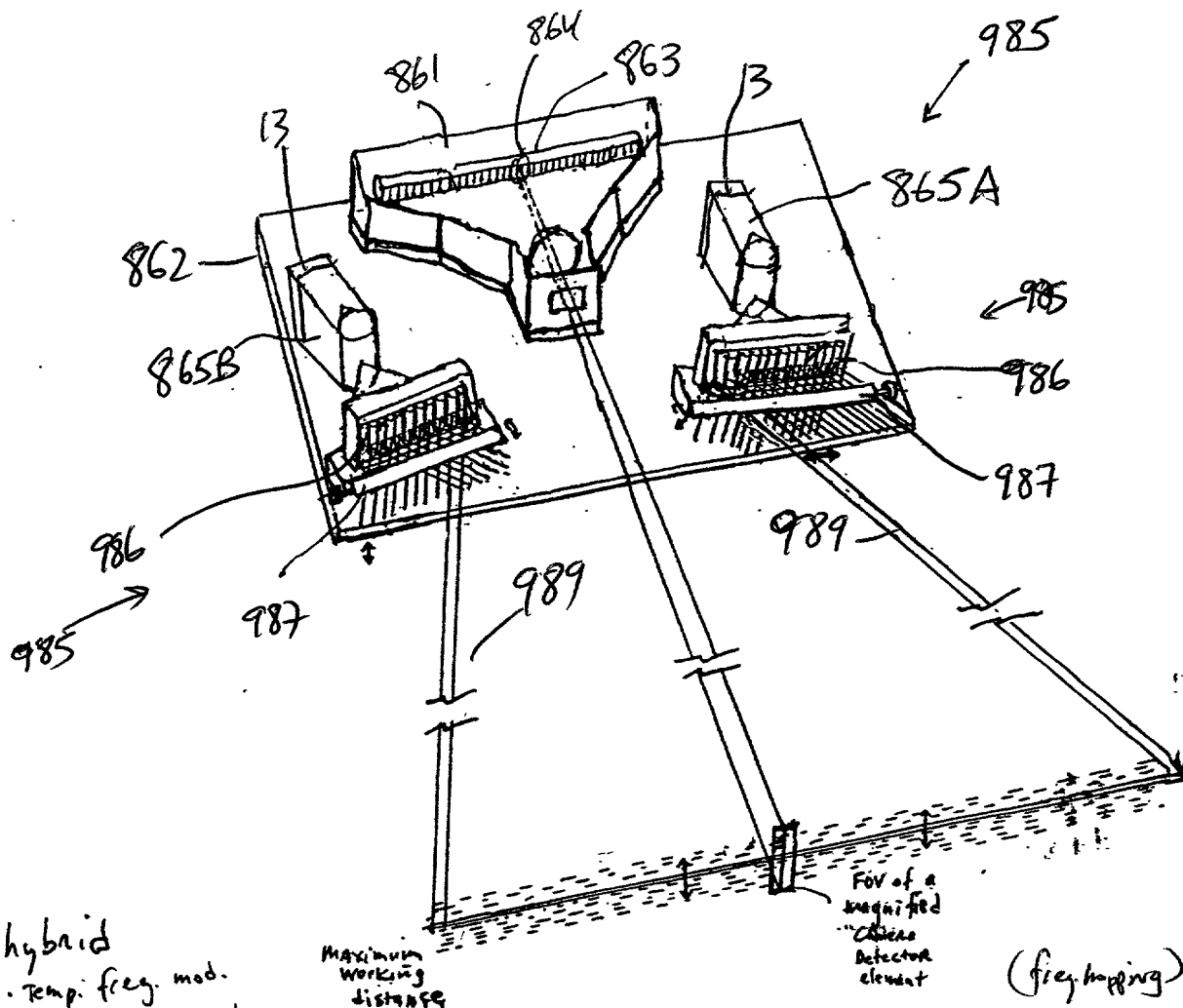


FIG. 1I25L2

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*

Transverse Microoscillation of PLIB

FIG. 1I25M1

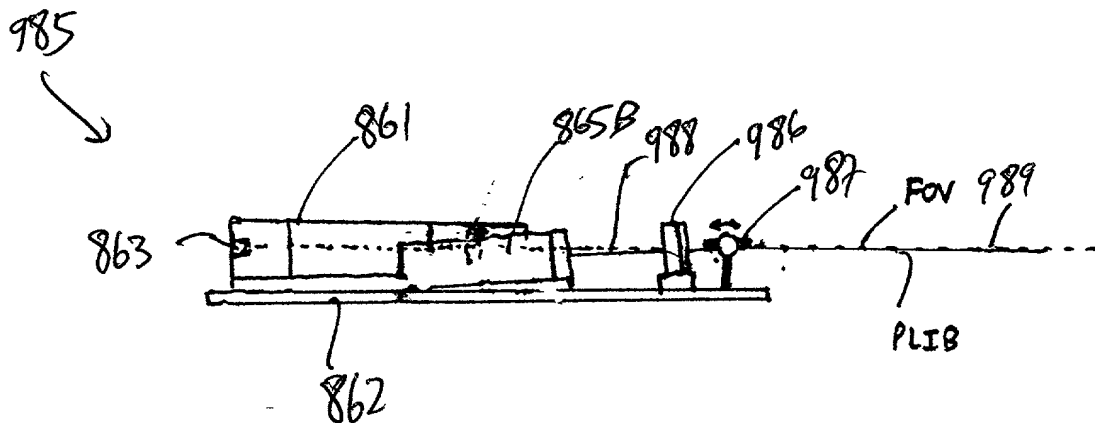


FIG. 1I25M2

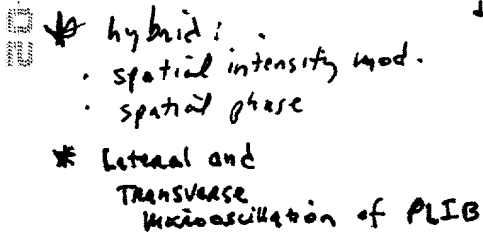


FIG. 1125N1



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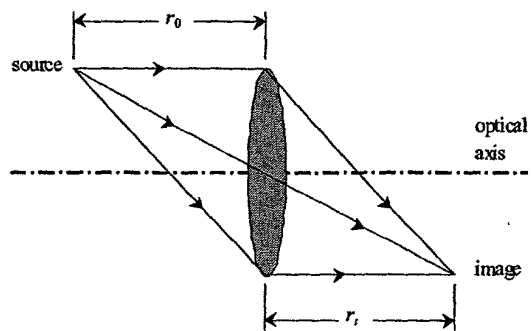


FIG. 1H1

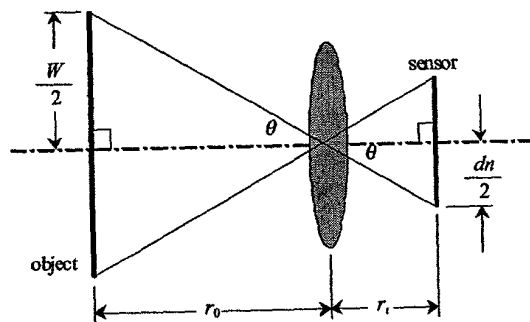


FIG. 1H2

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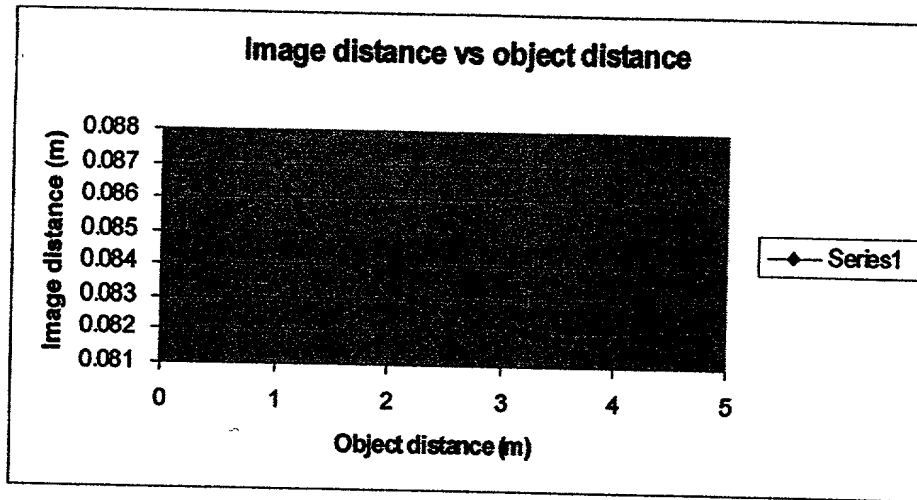


FIG. 1H3

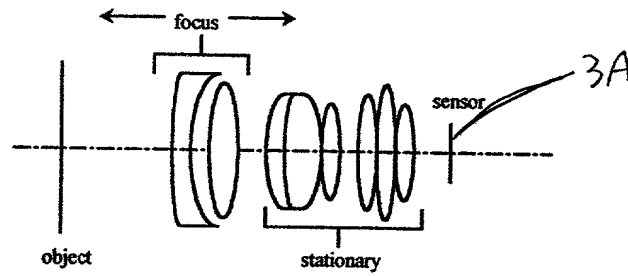


FIG. 1H4

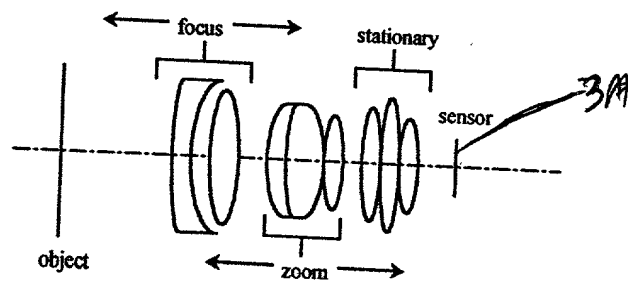


FIG. 1H5

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Fixed focal length lens cases

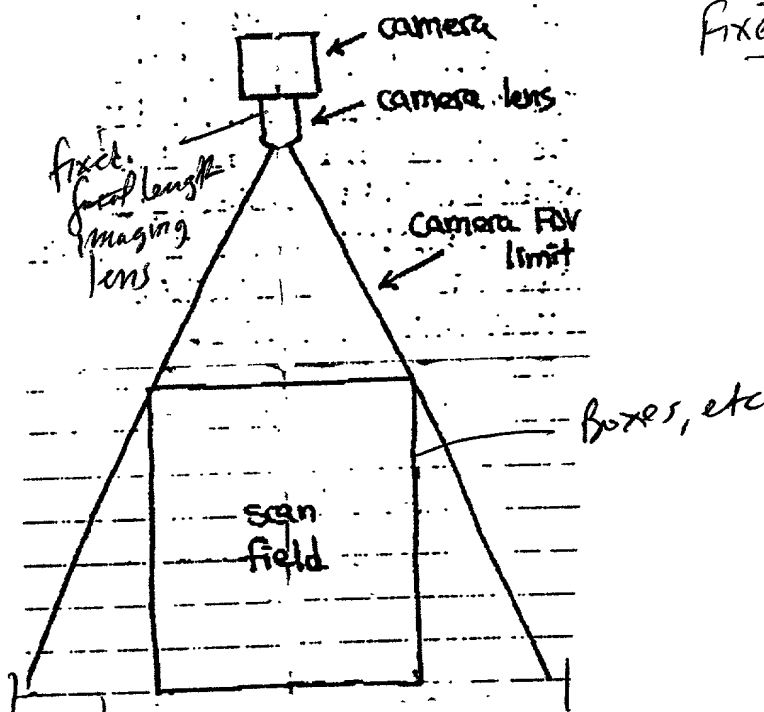


FIG. 1K1
conveyor 34

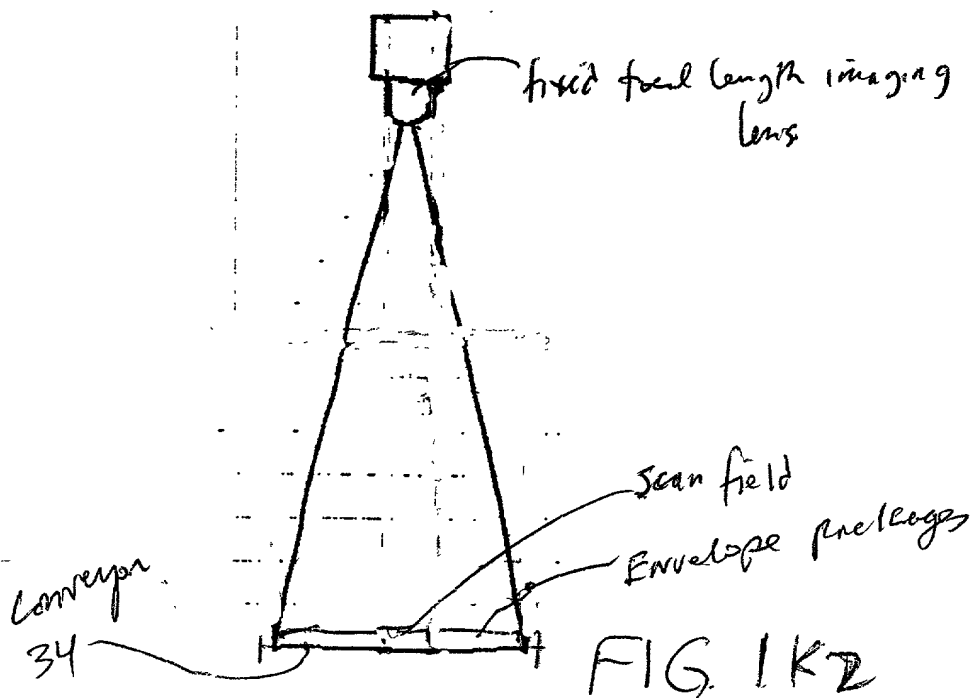
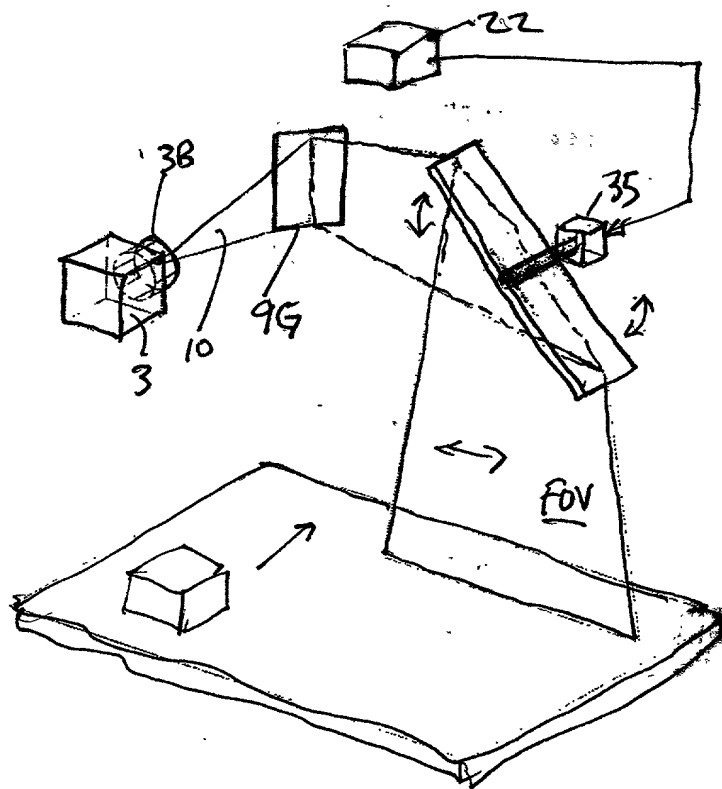
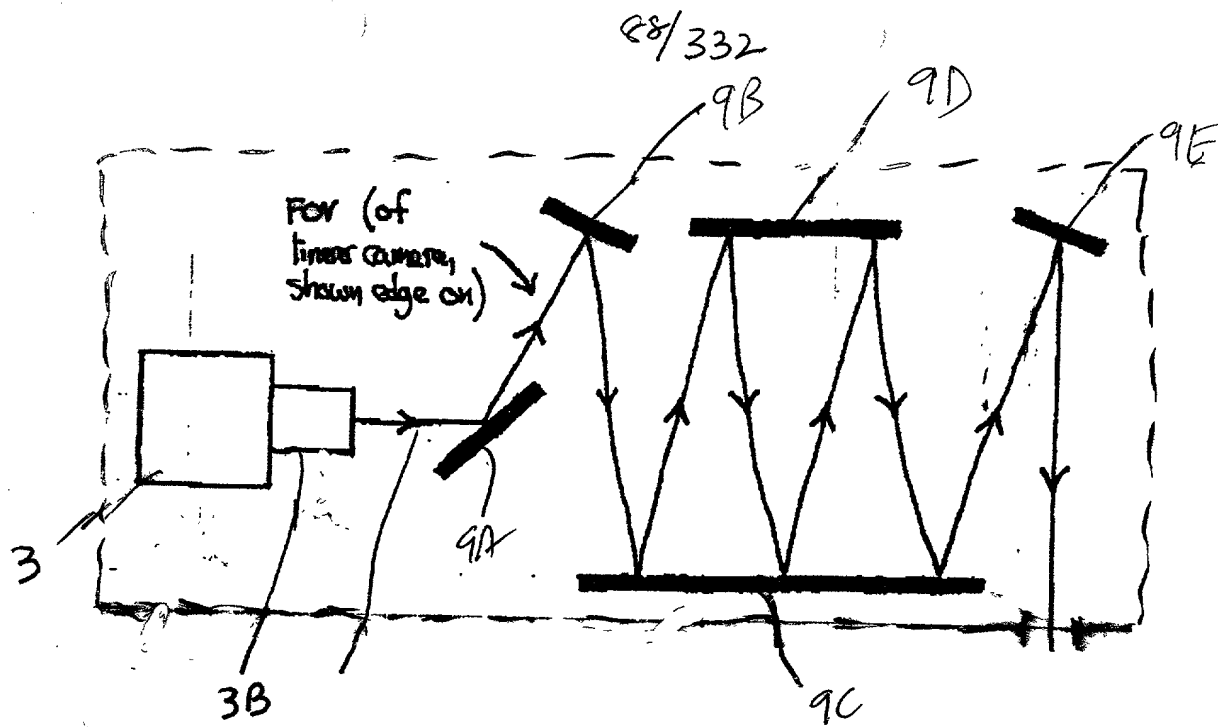


FIG. 1K2



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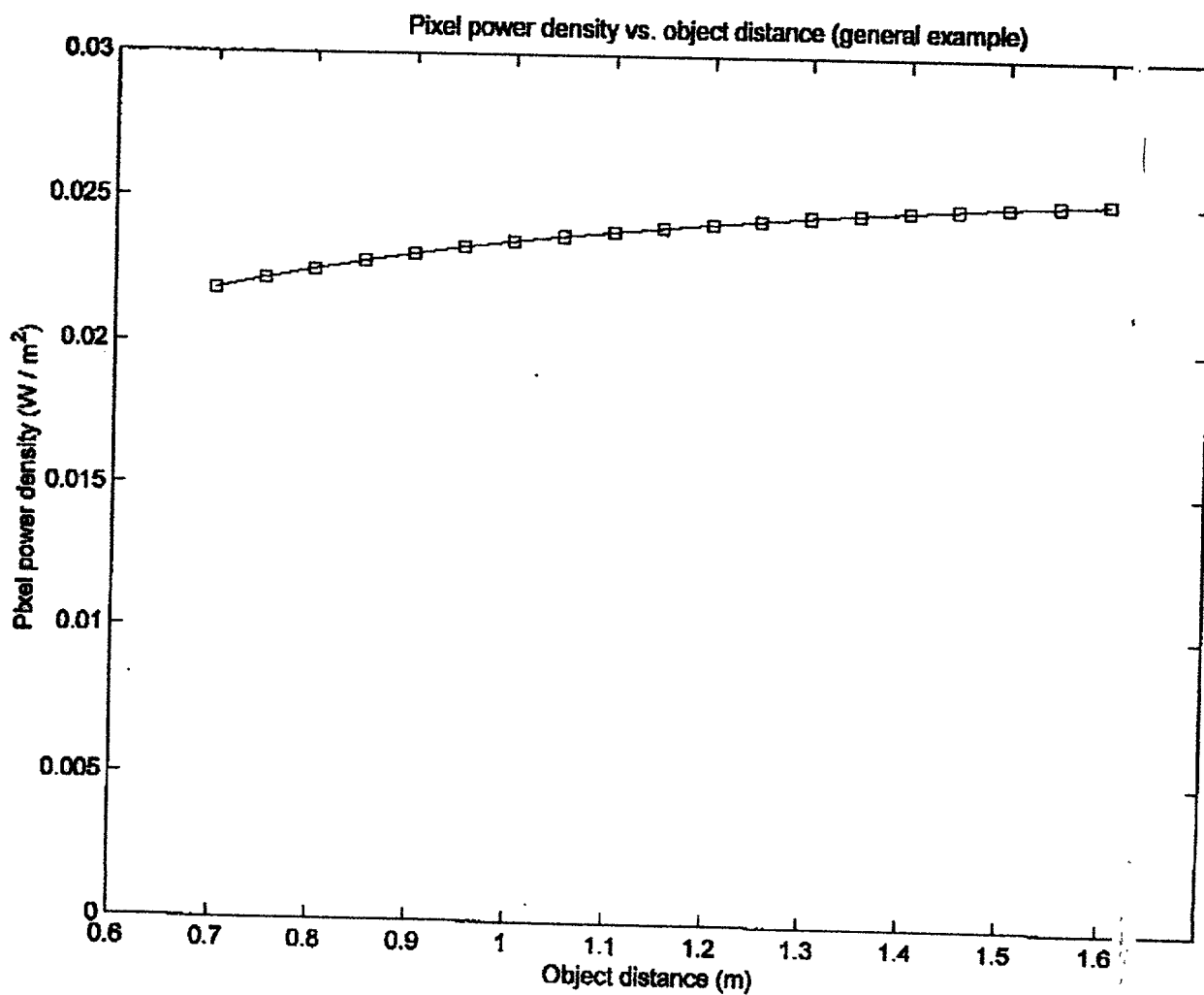


FIG-1M1

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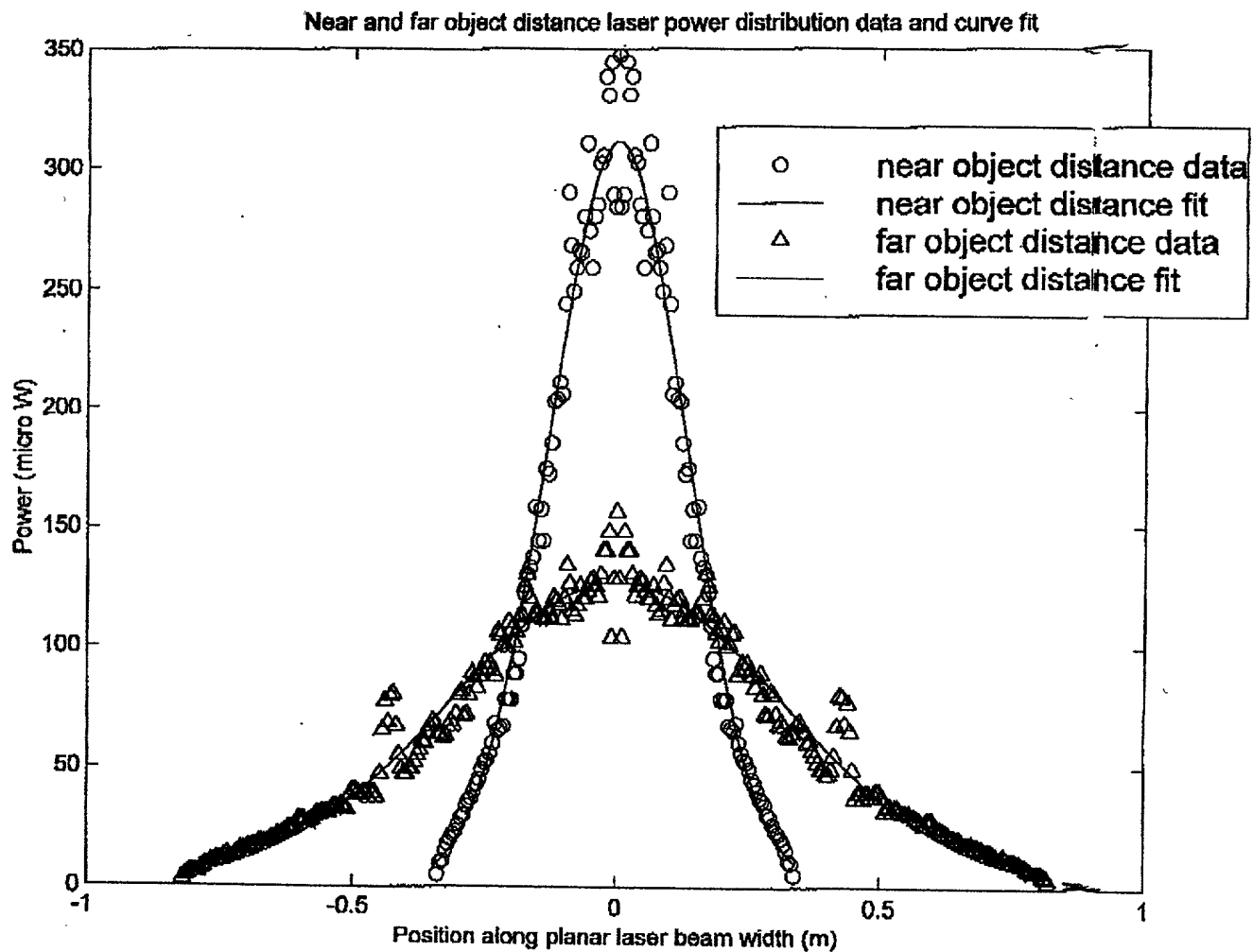


FIG. 1M2

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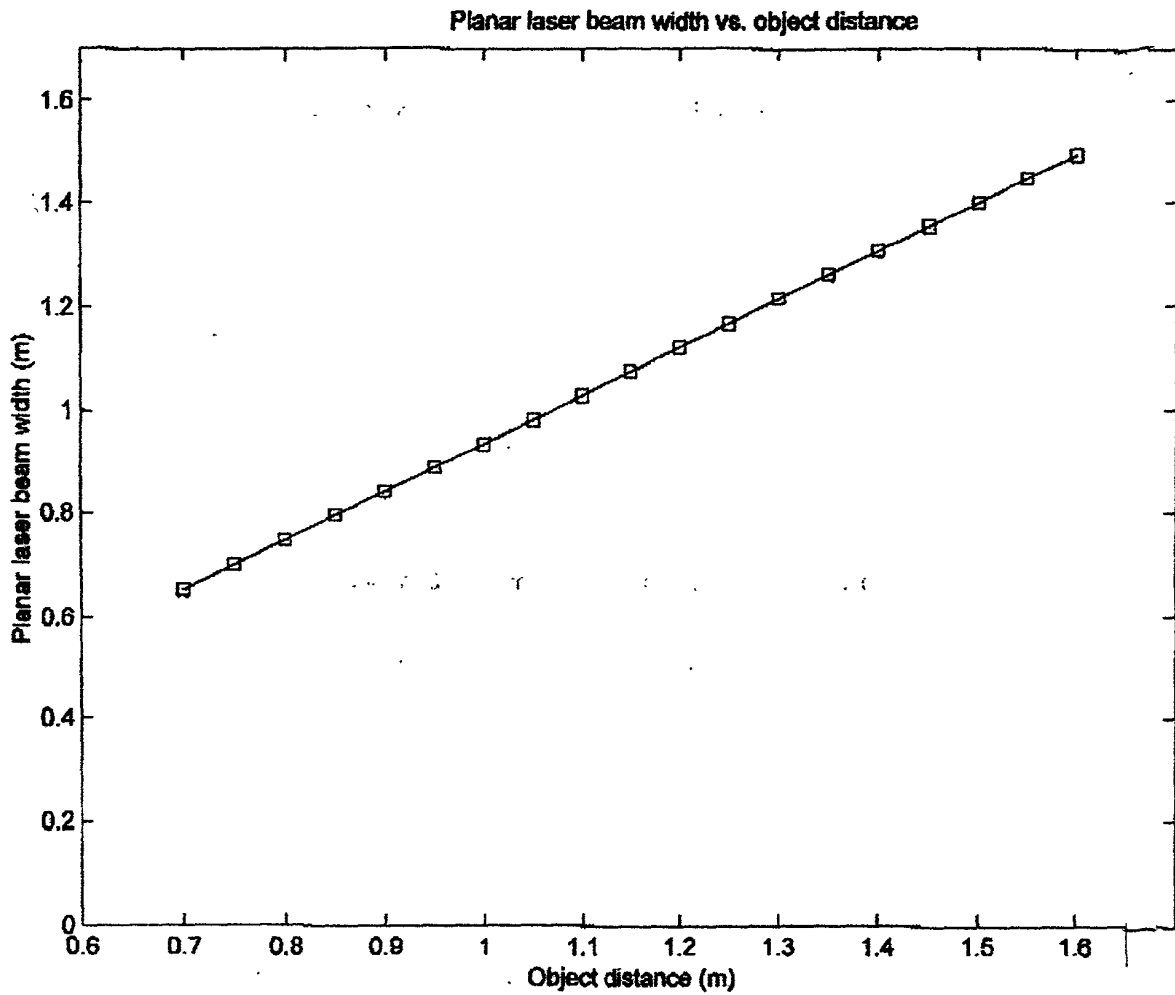
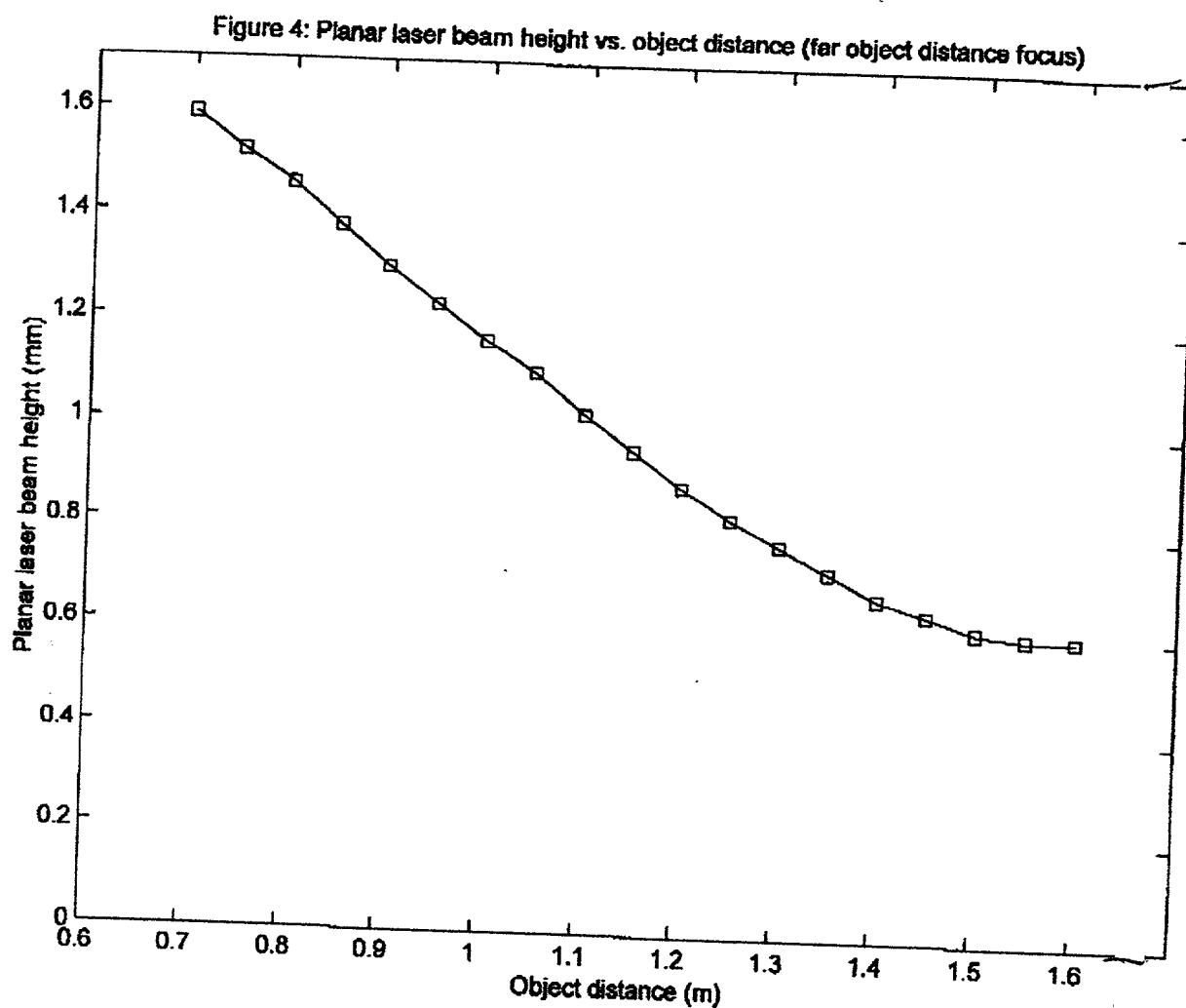


FIG. 1M3

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FIG/M4

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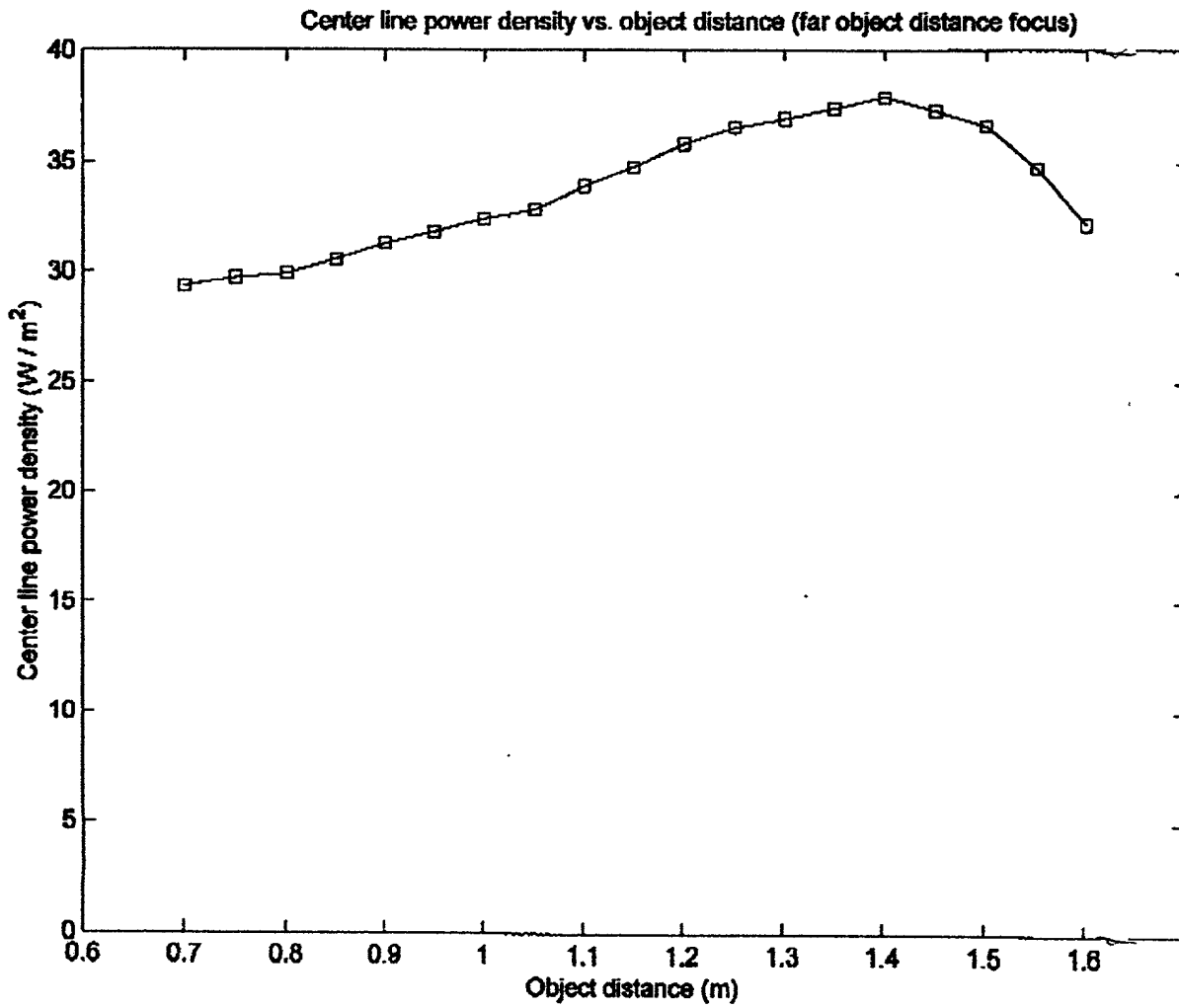


FIG. 1N

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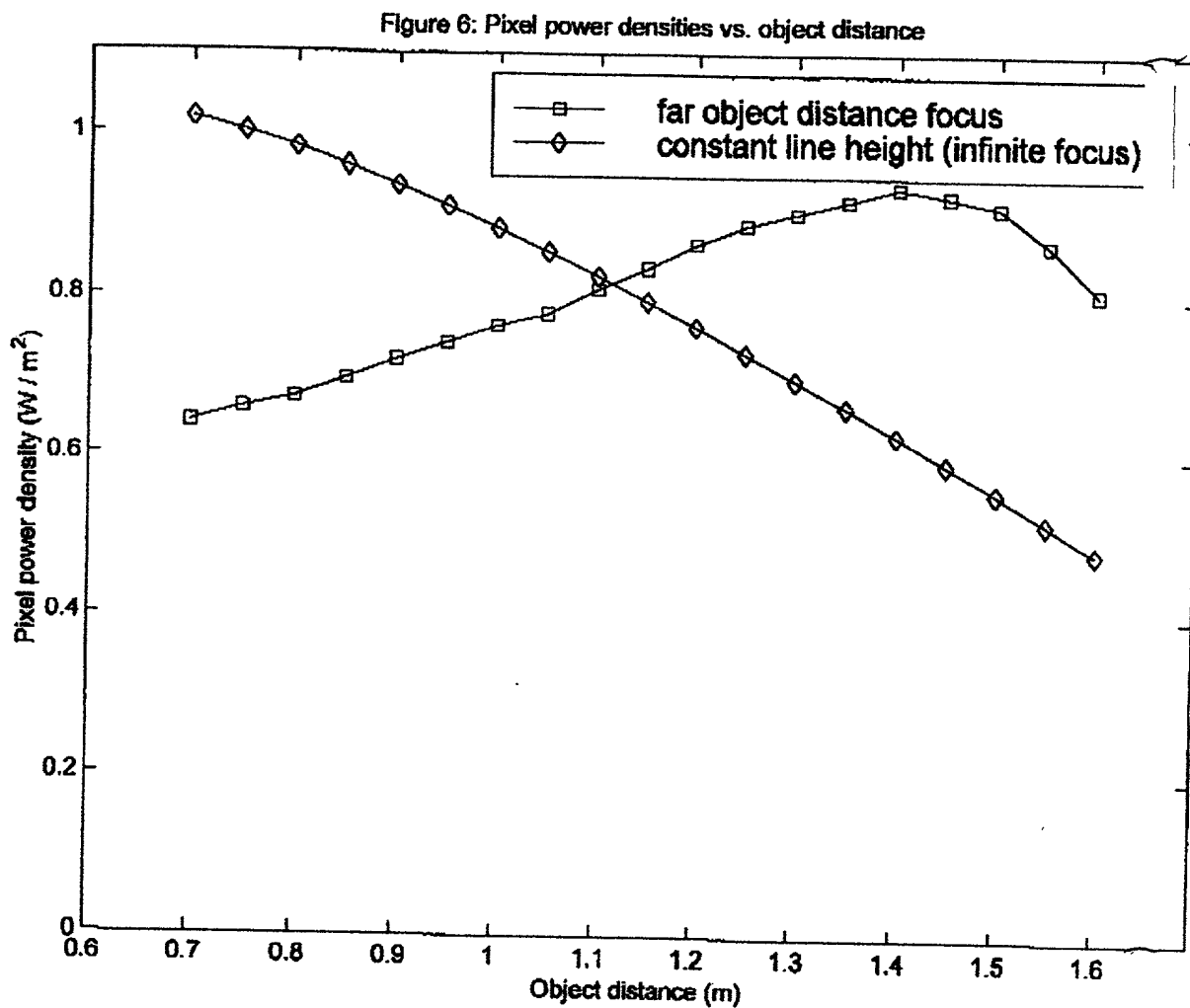


FIG. 10

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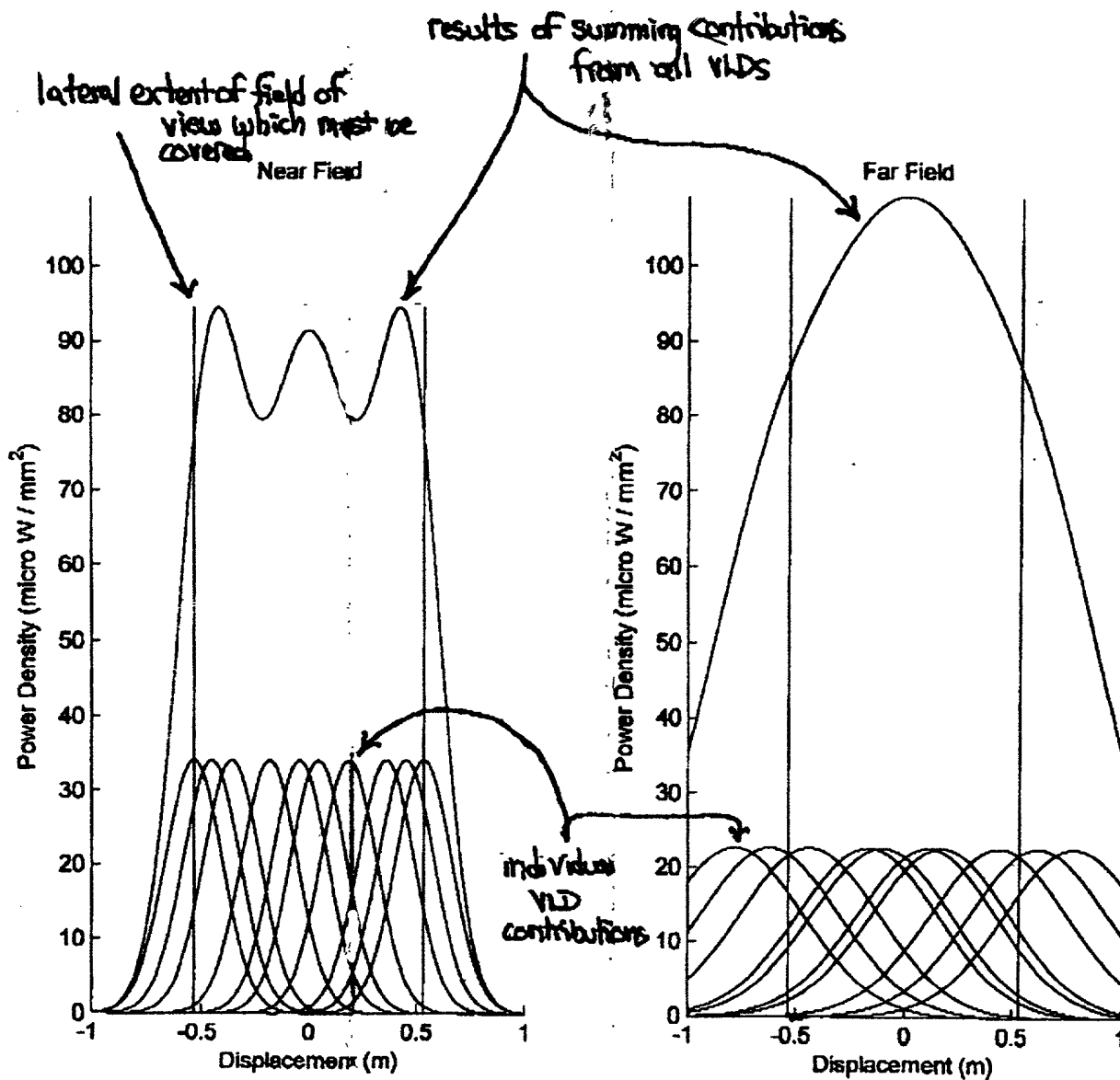


FIG 1P1

FIG 1P2

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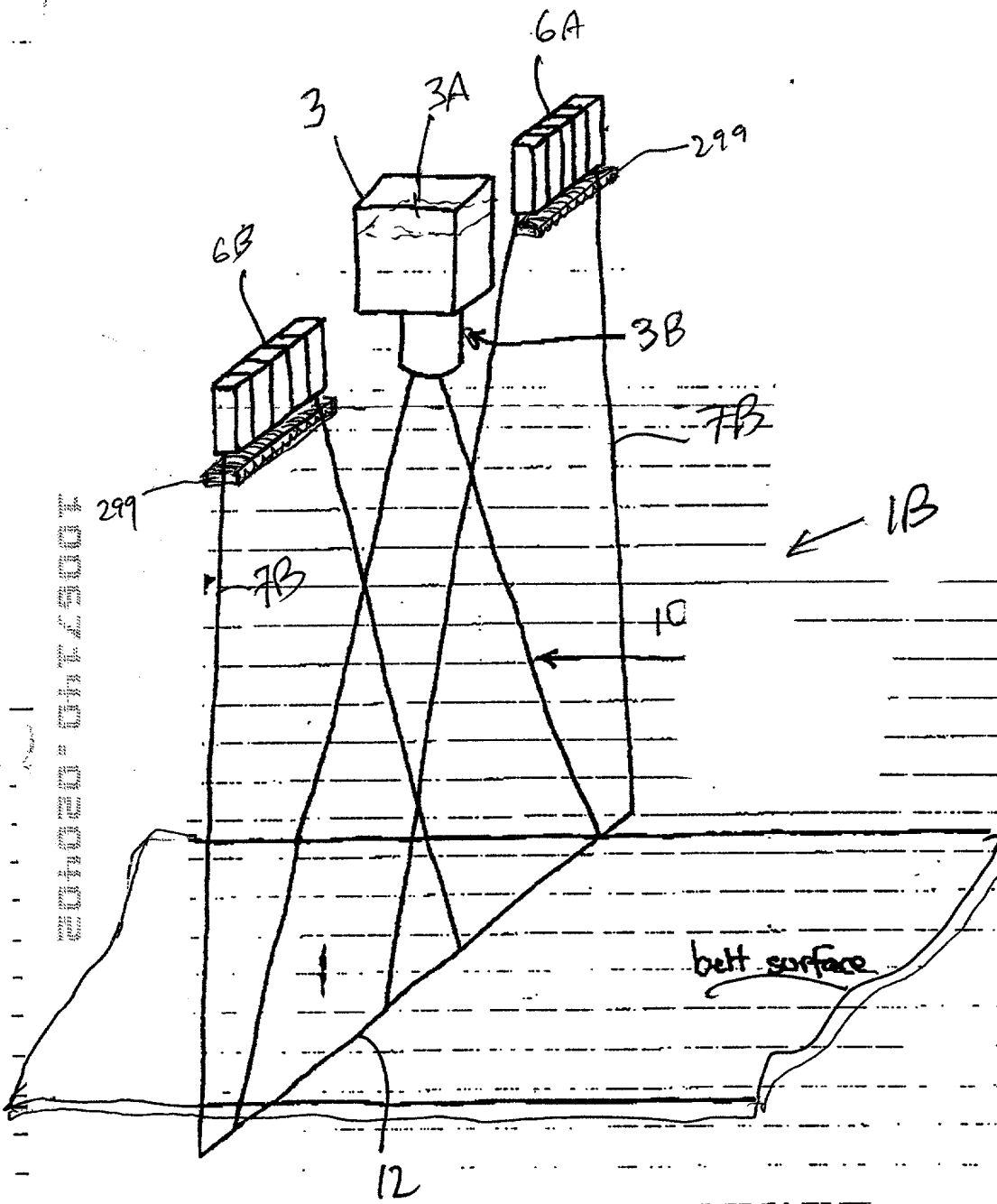


FIG. 1Q1

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fixed focal length / fixed focal distance

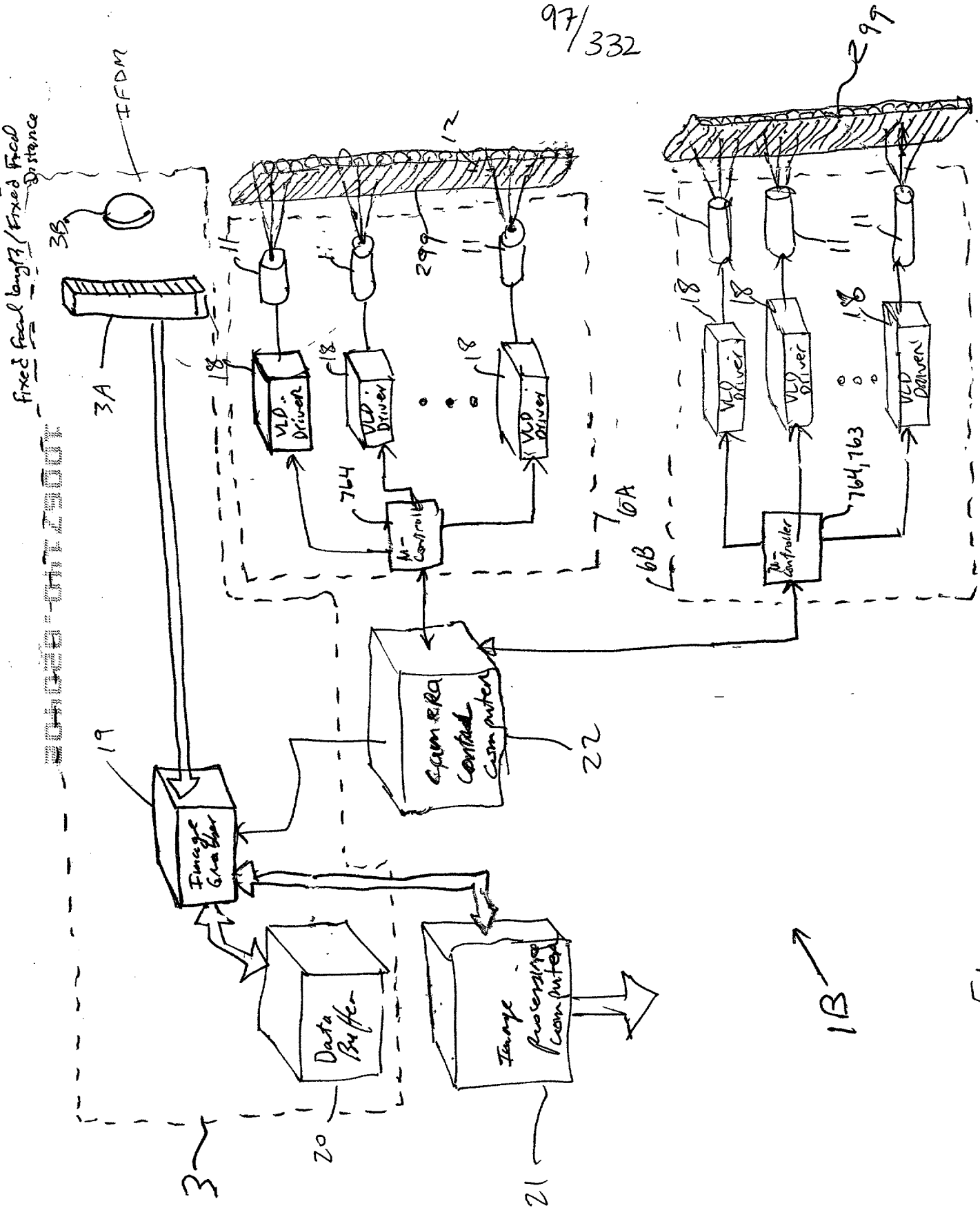


FIG. 10QZ

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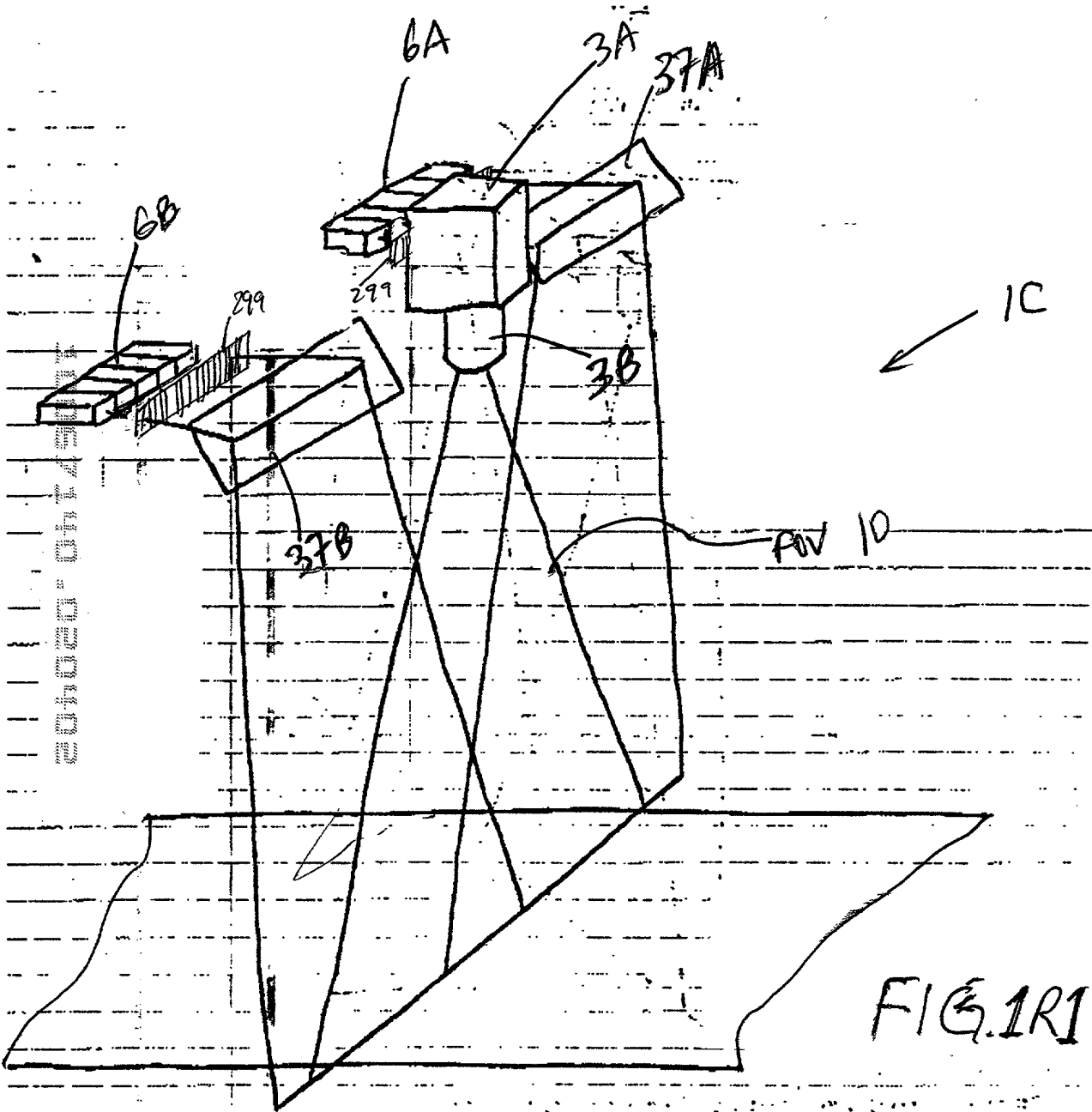
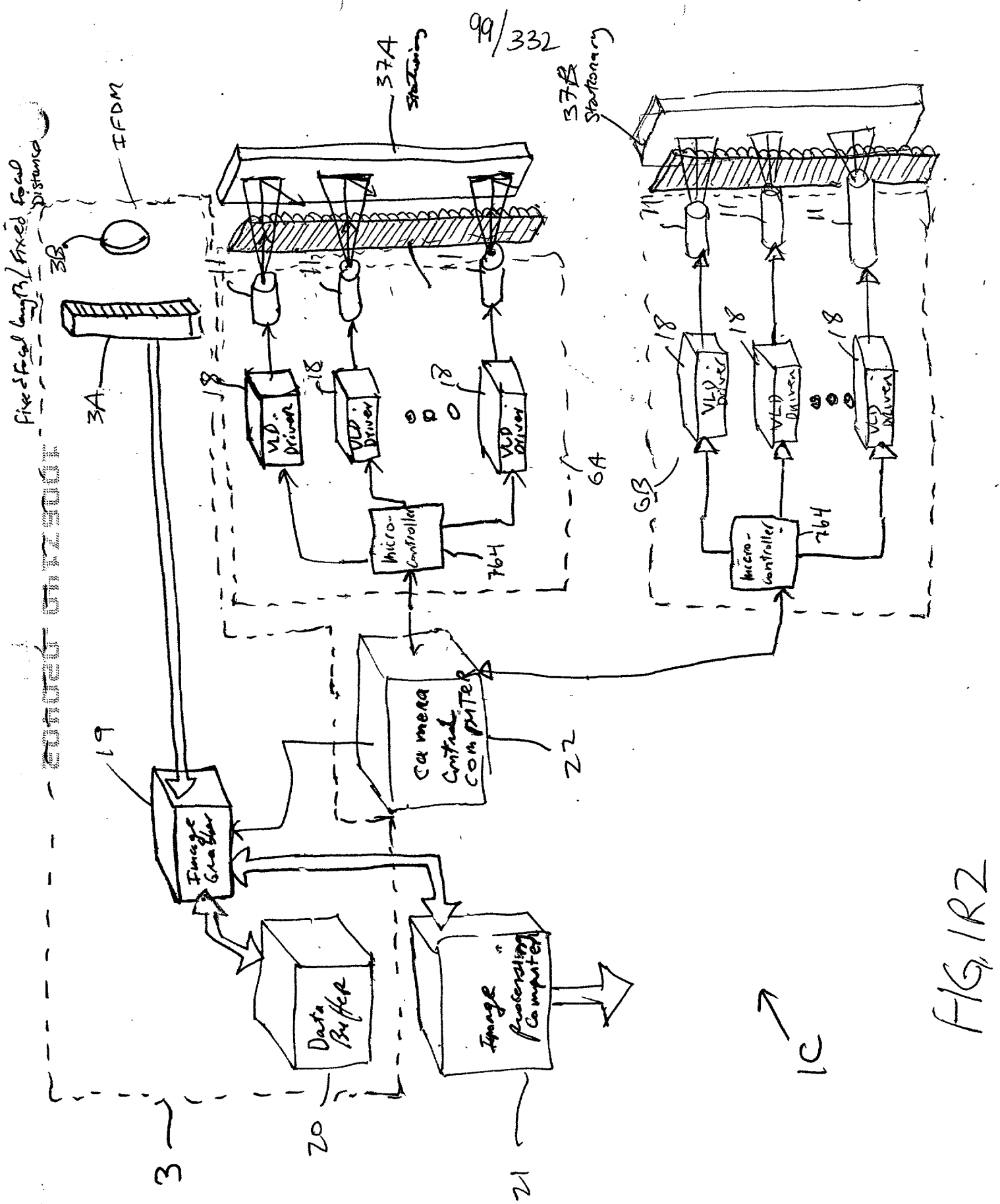


FIG. 1R1



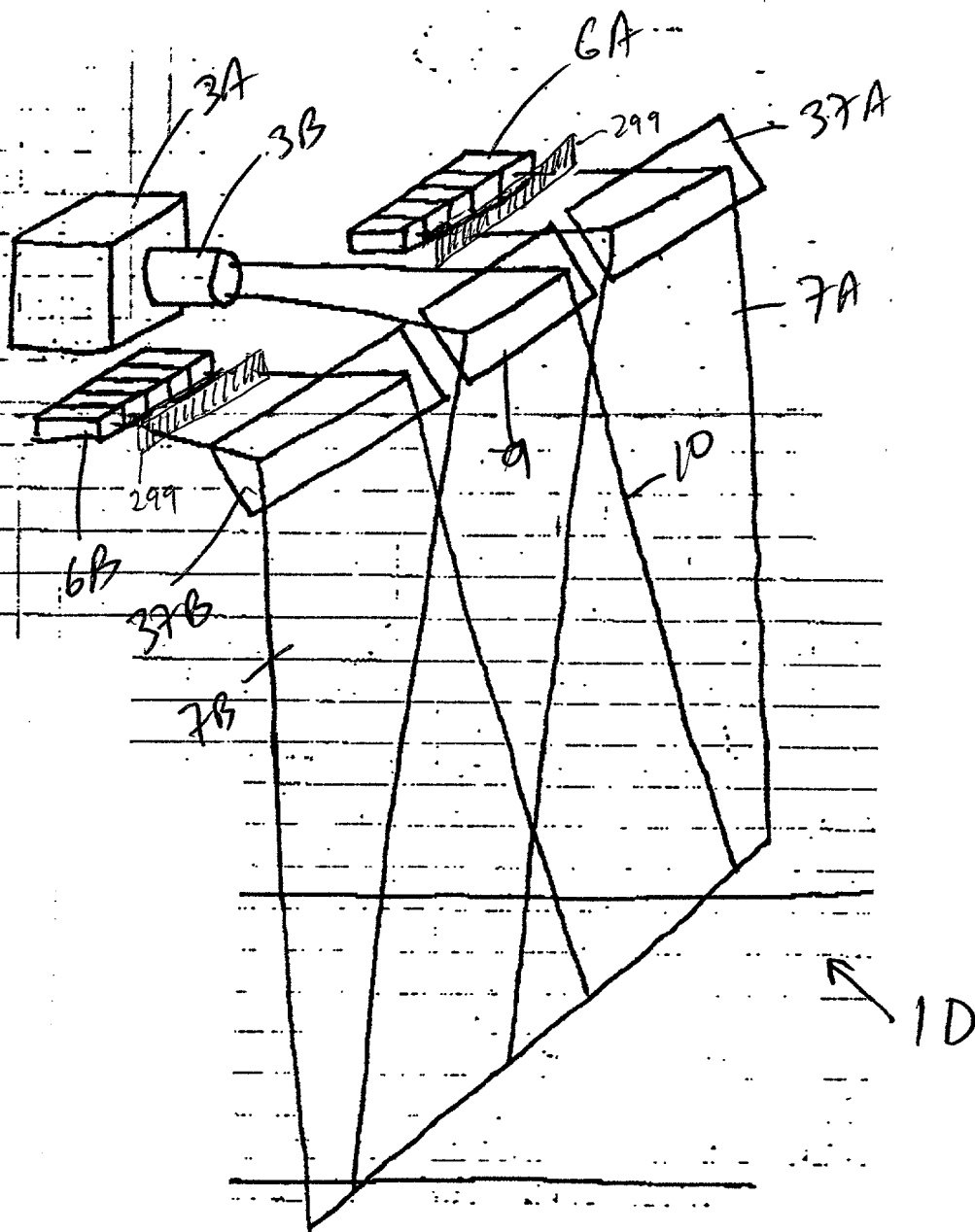
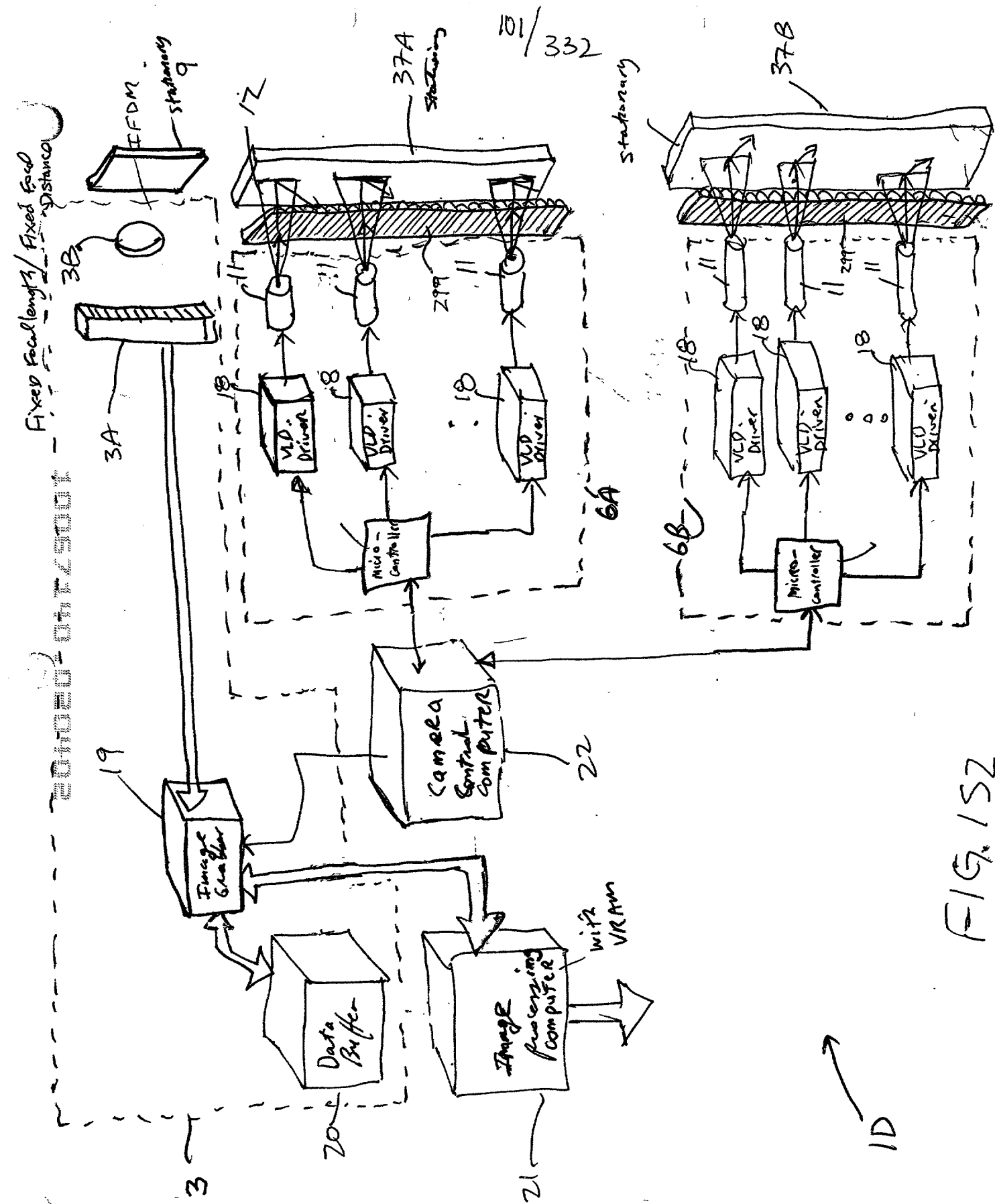


FIG. 151



10067440 200007

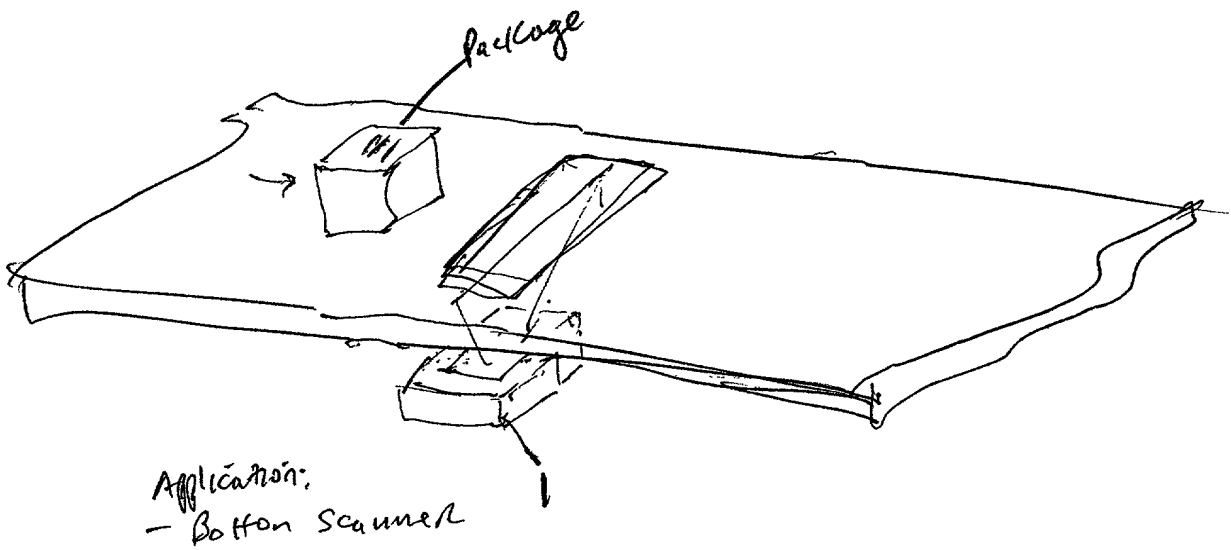
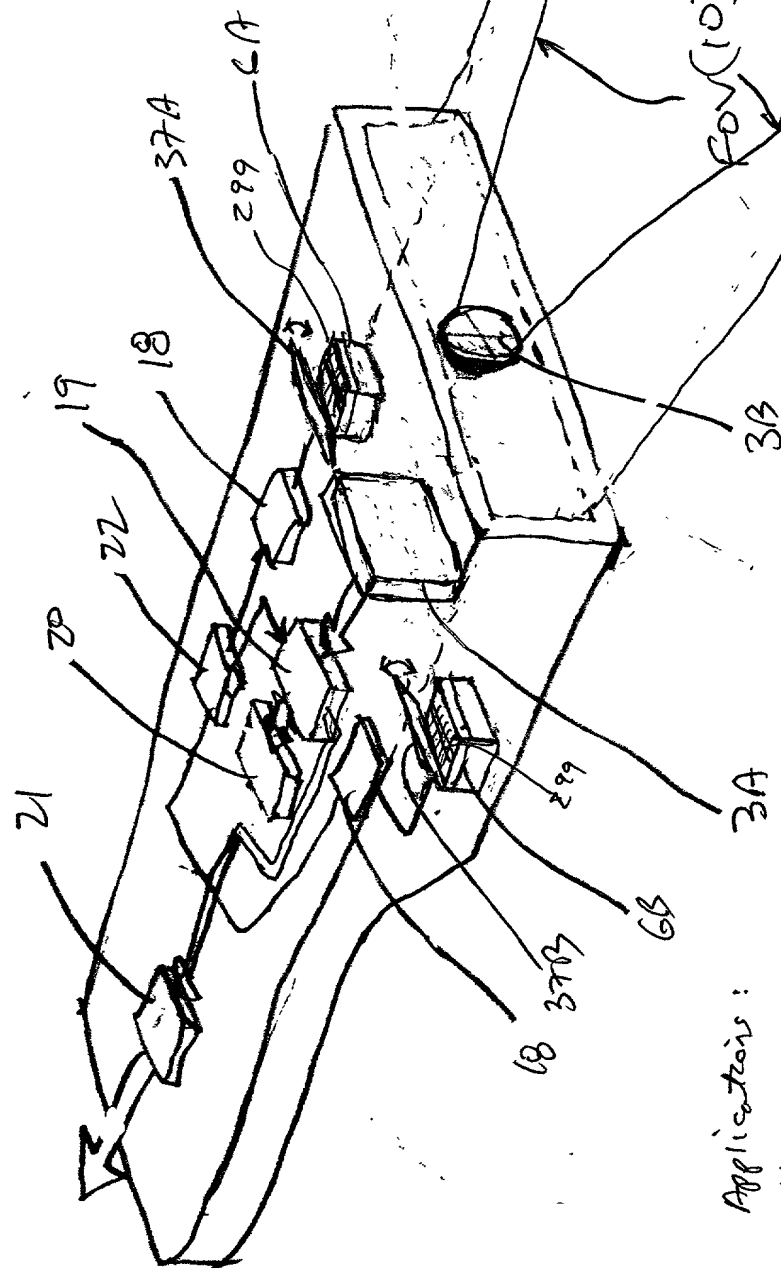


FIG 1T

1C



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Plane of
Laser
Illumination

12

FOV(10)

3A

Applications:
• Hand-Held Scanner
• Presentation Scanner

FIG. 1U

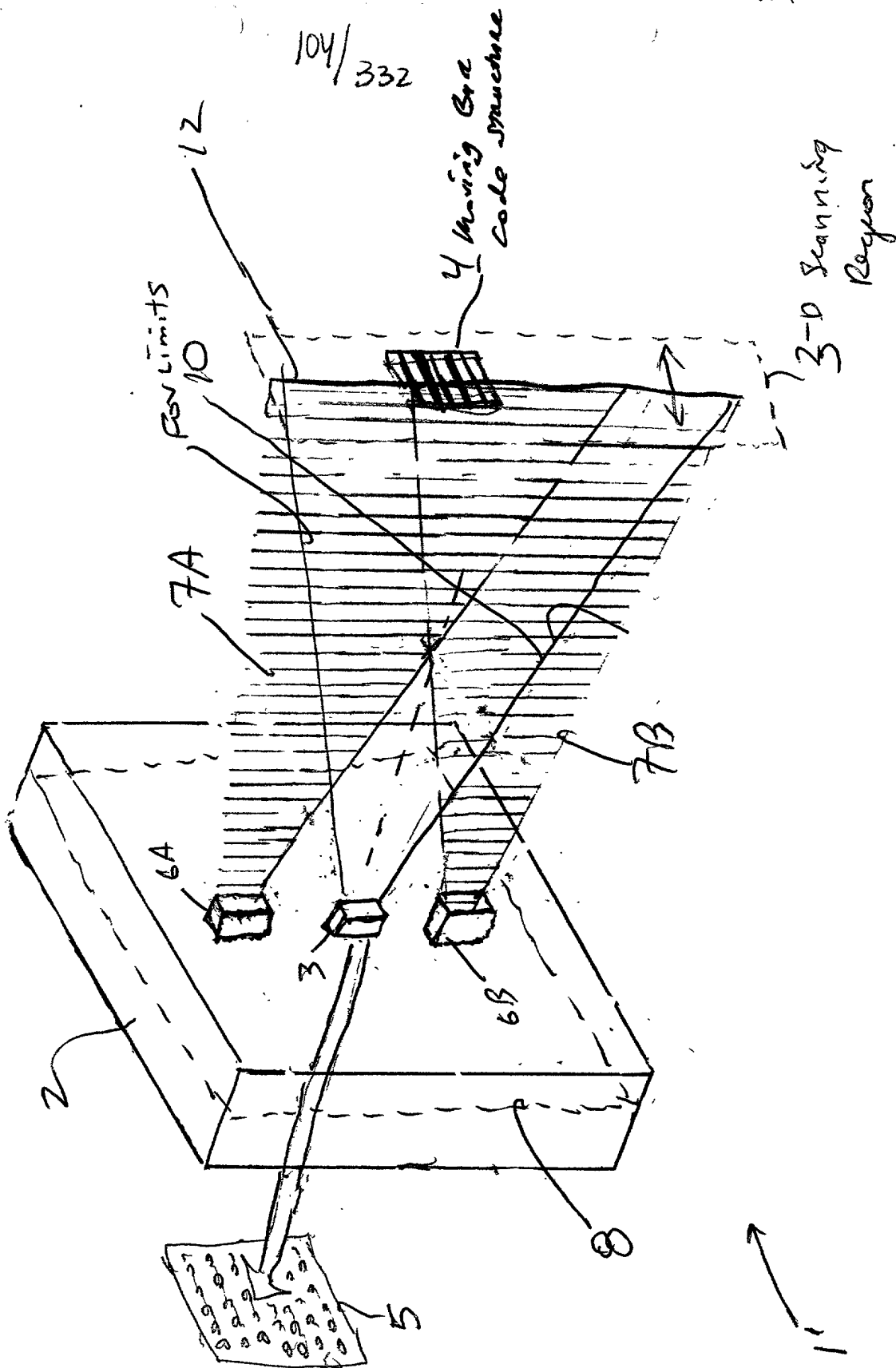


FIG. 1VI

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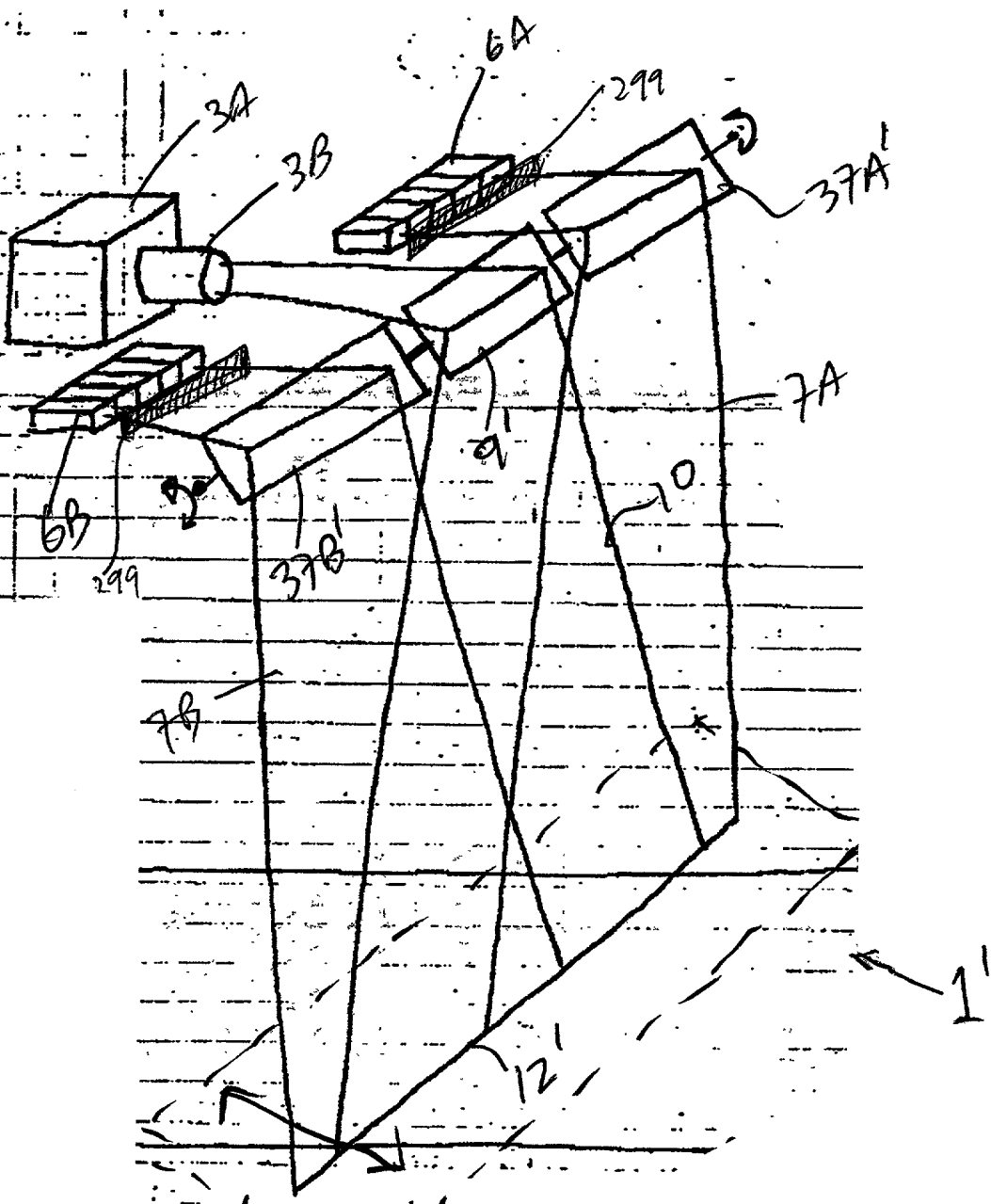


FIG. IV2

2-D
region
of
space

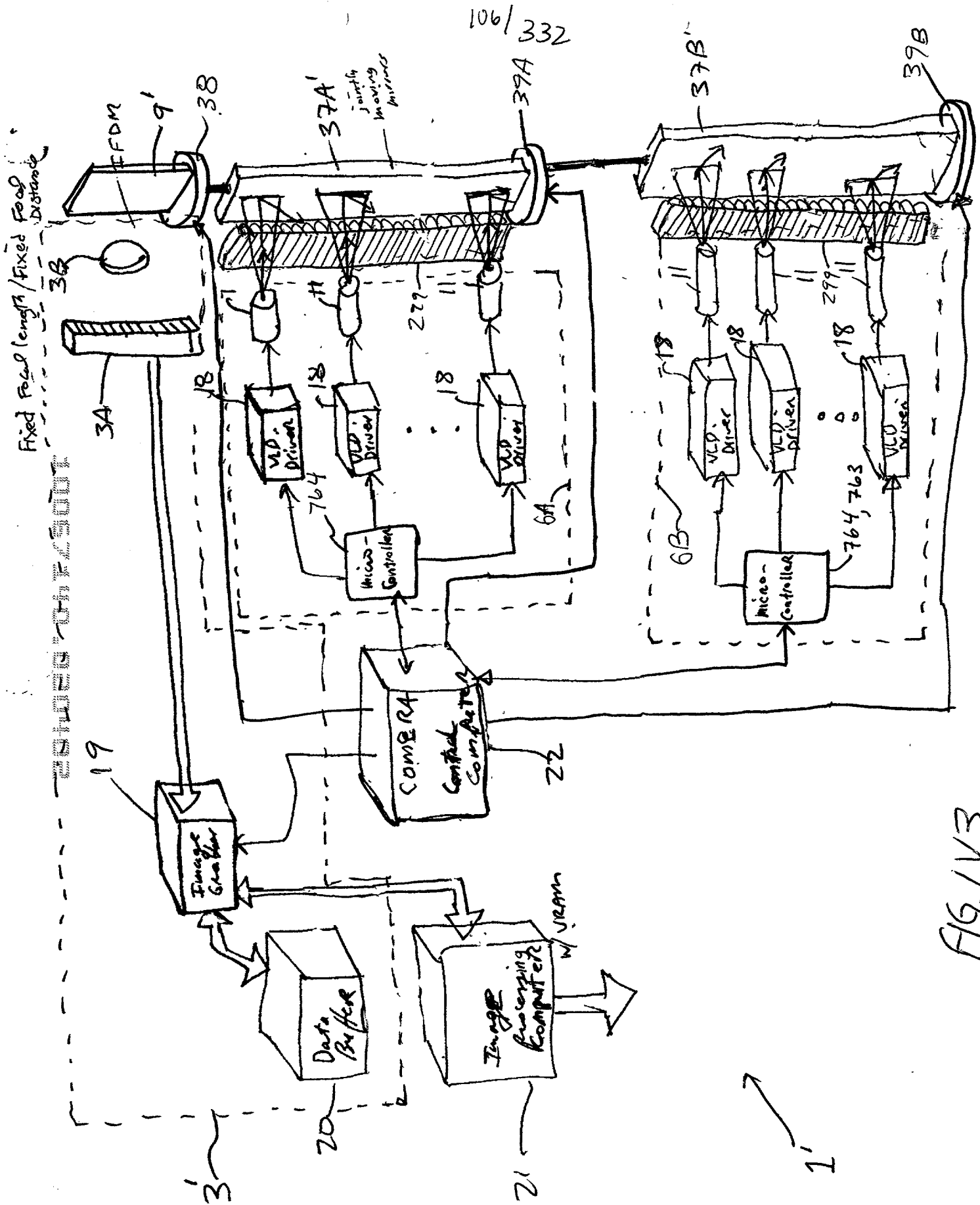


Fig. 1V3

- Hand-held scanner
- Presen to ~~top~~ scanner

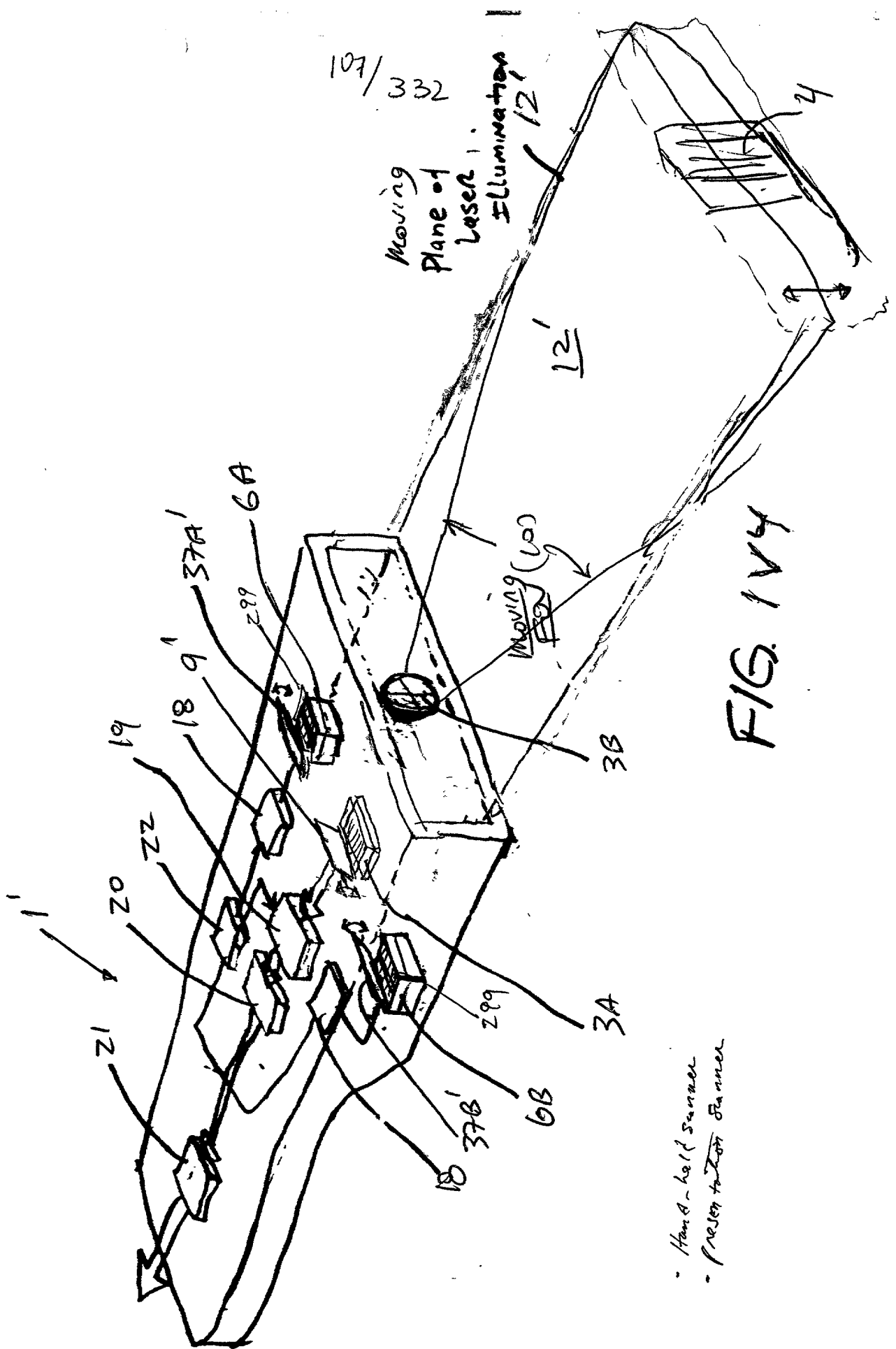


FIG. 1V4

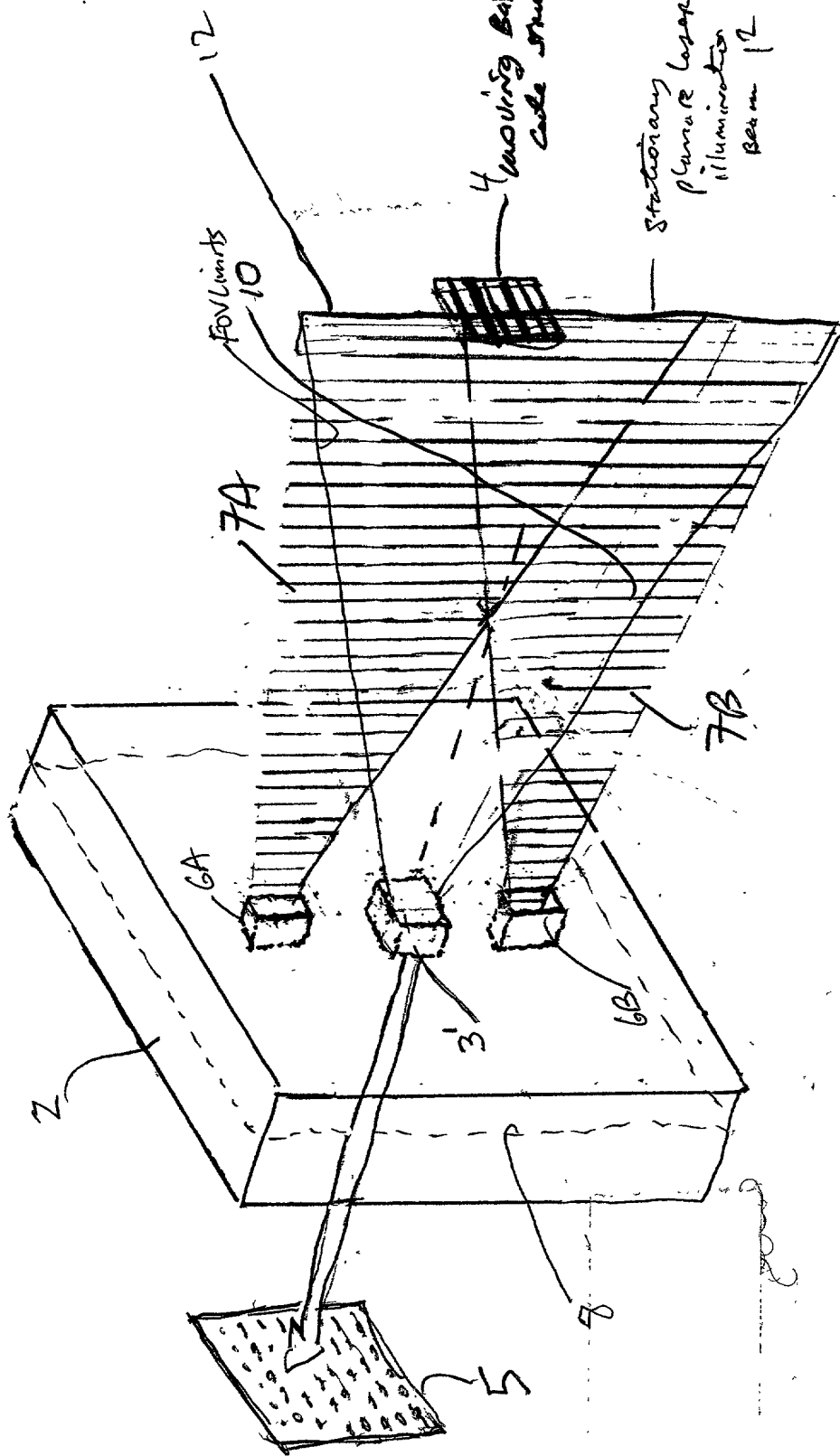


FIG. 2A

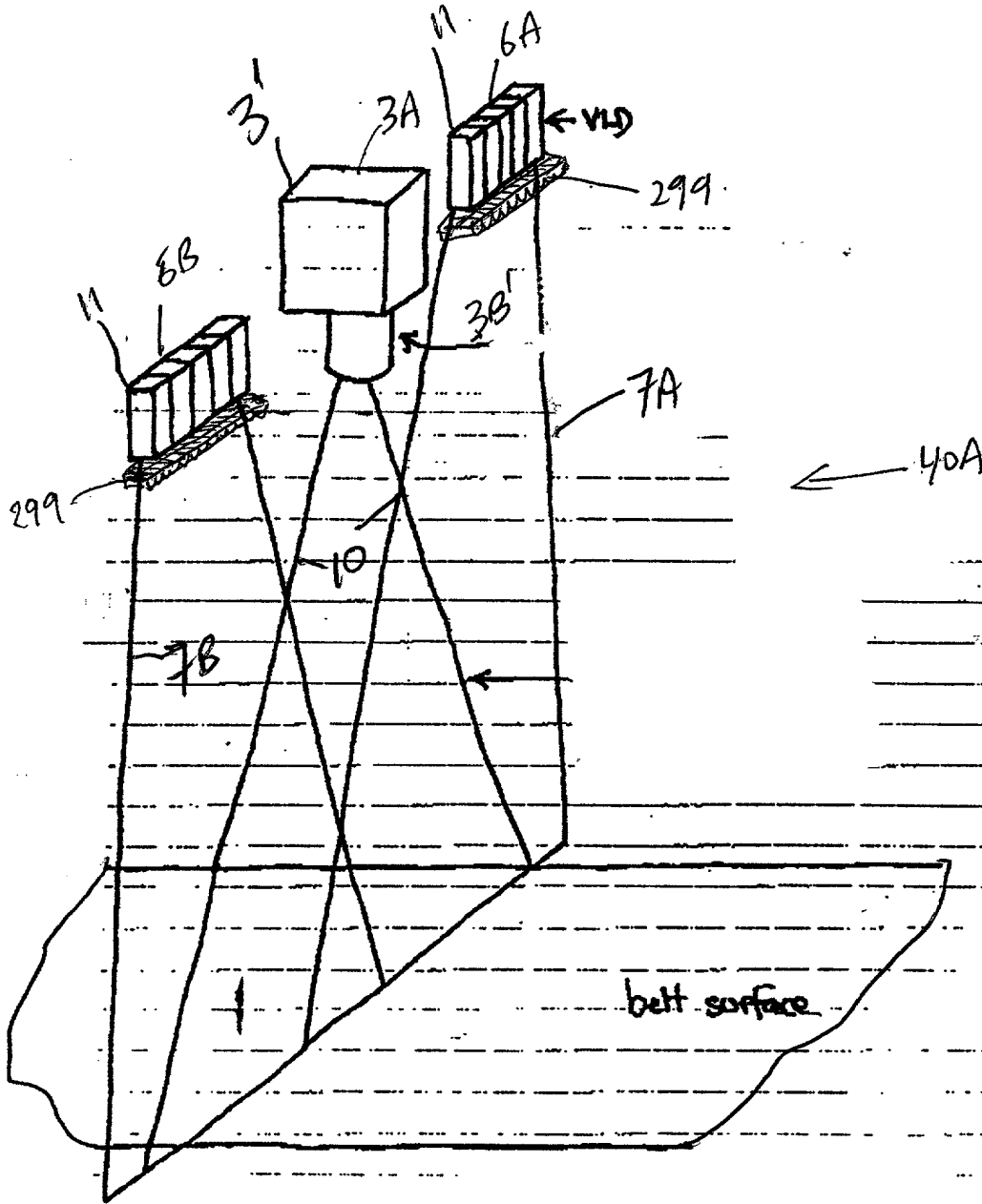
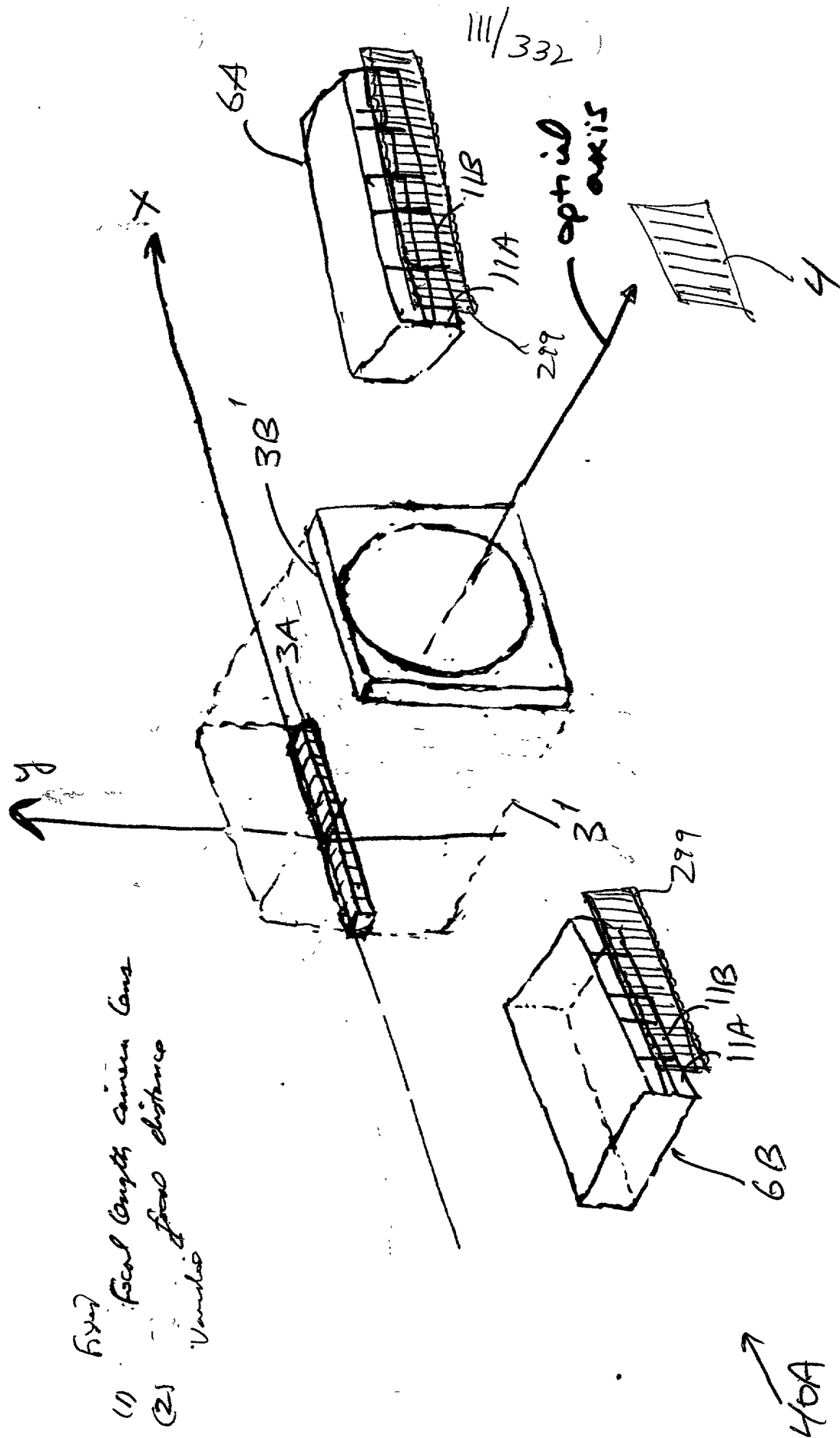


FIG. 2 B1



- Fixed
- (1) focal length camera lens
 - (2) focal distance
- Variable

FIG. 2B2

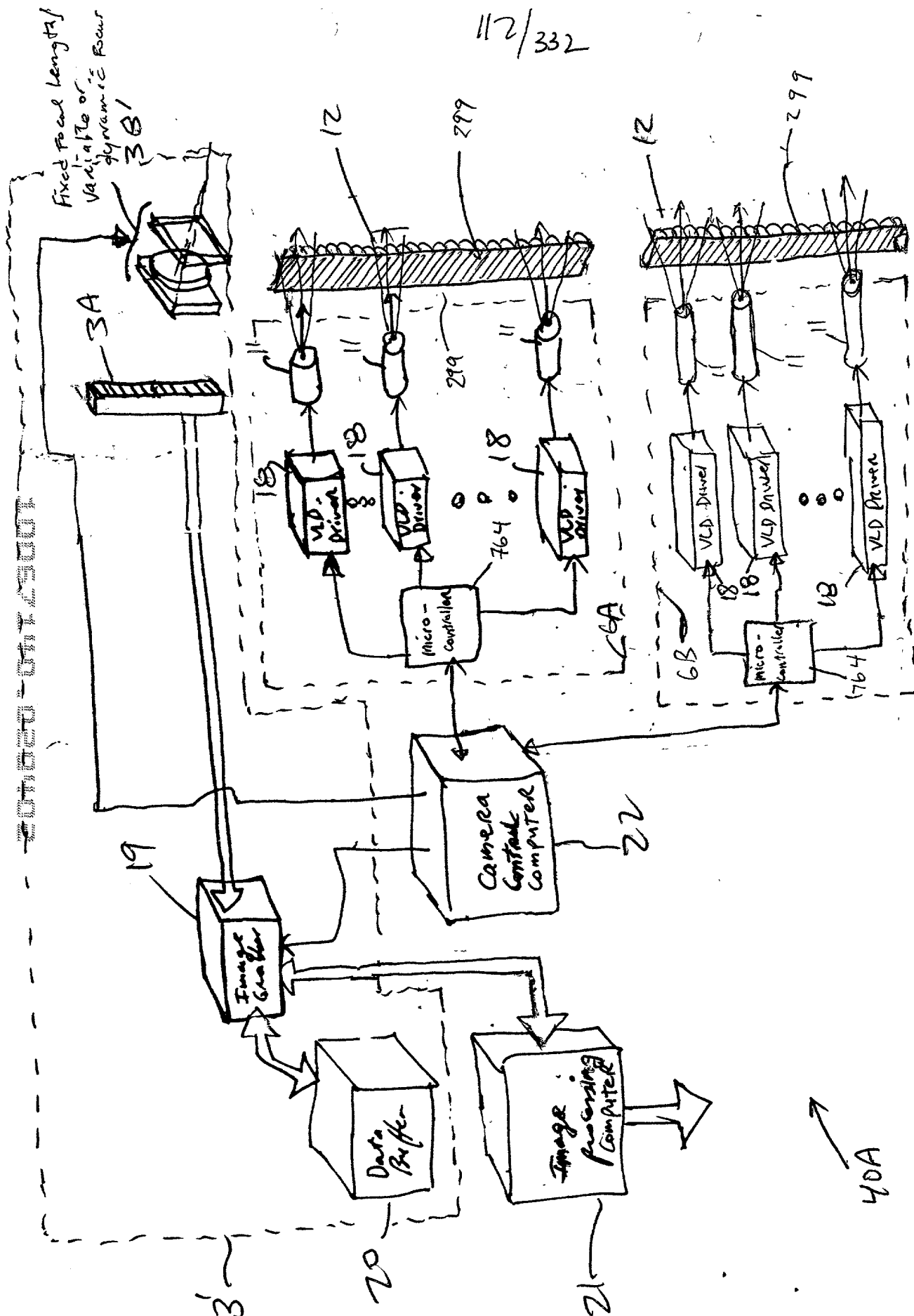


Fig. 2C1

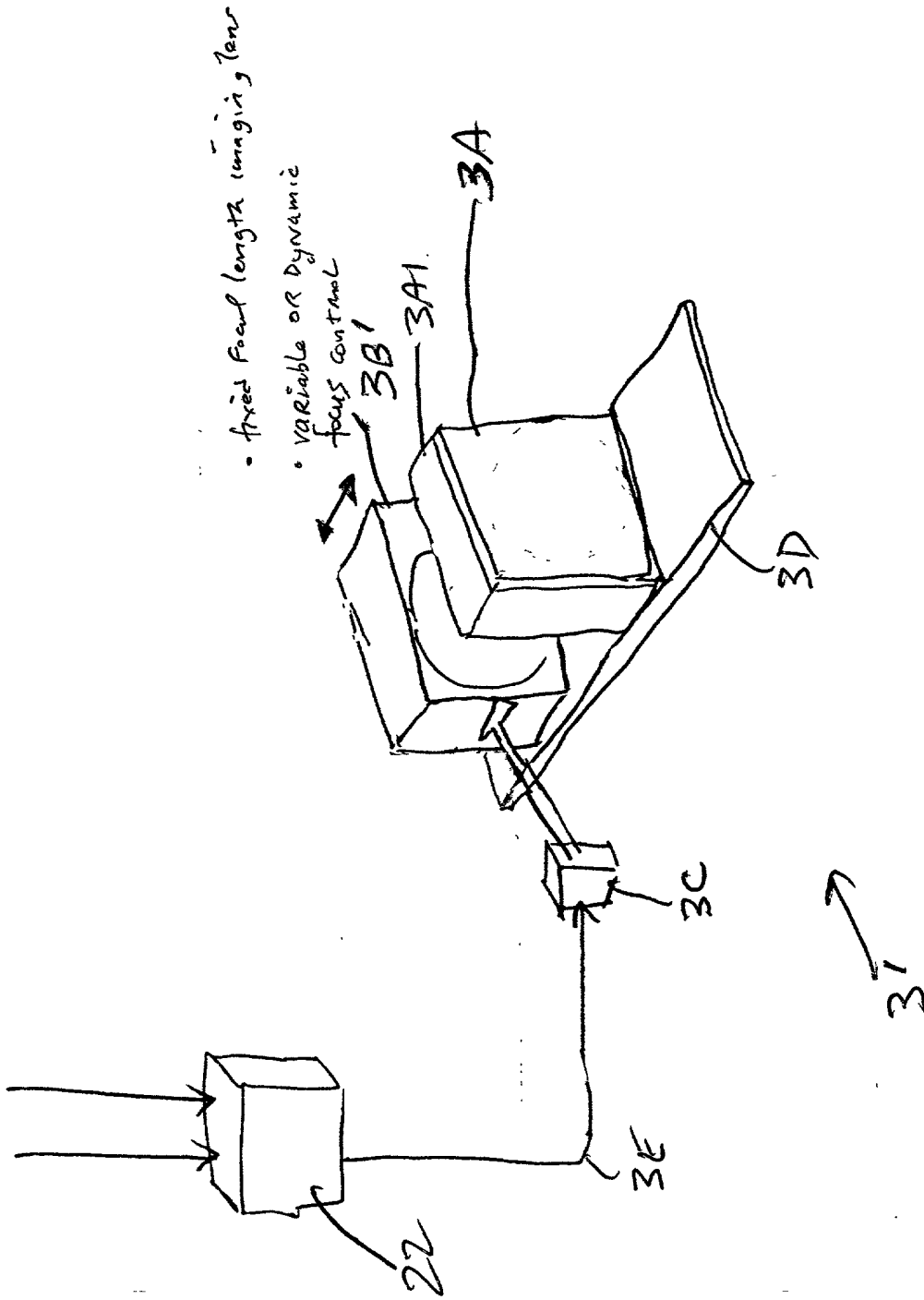


FIG. 2C2

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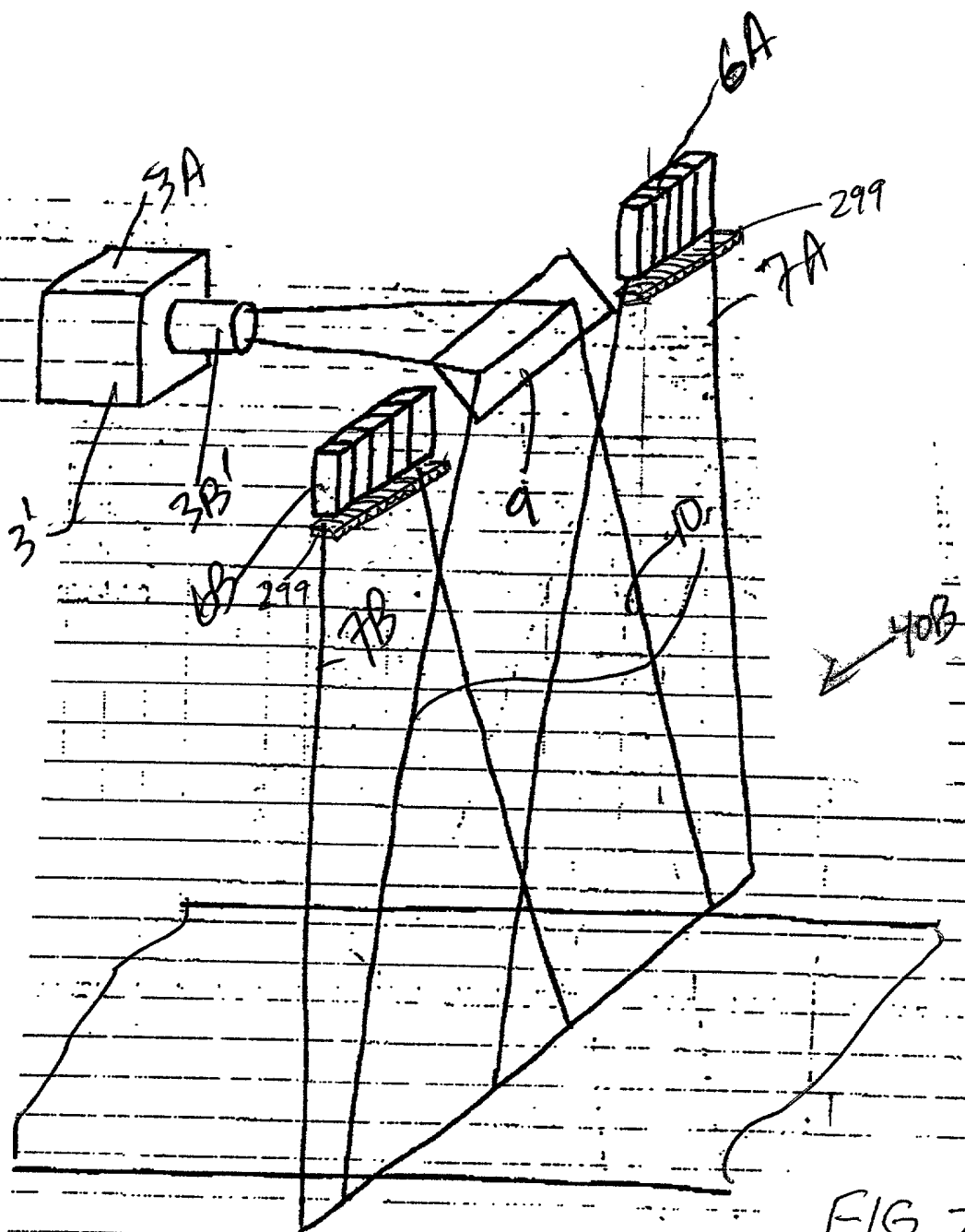


FIG. 2D1



FIG. 2D2

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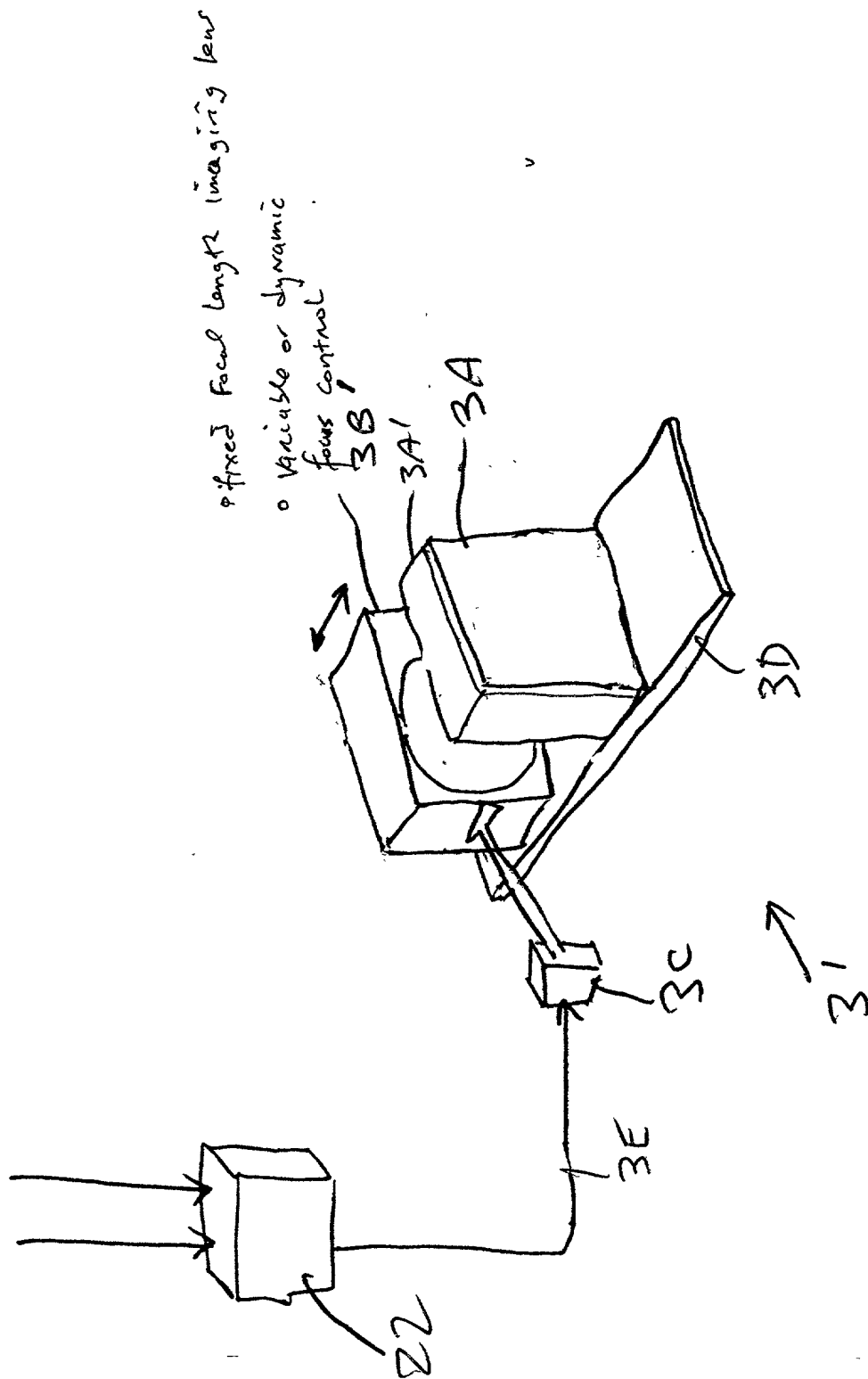


FIG. 2D3

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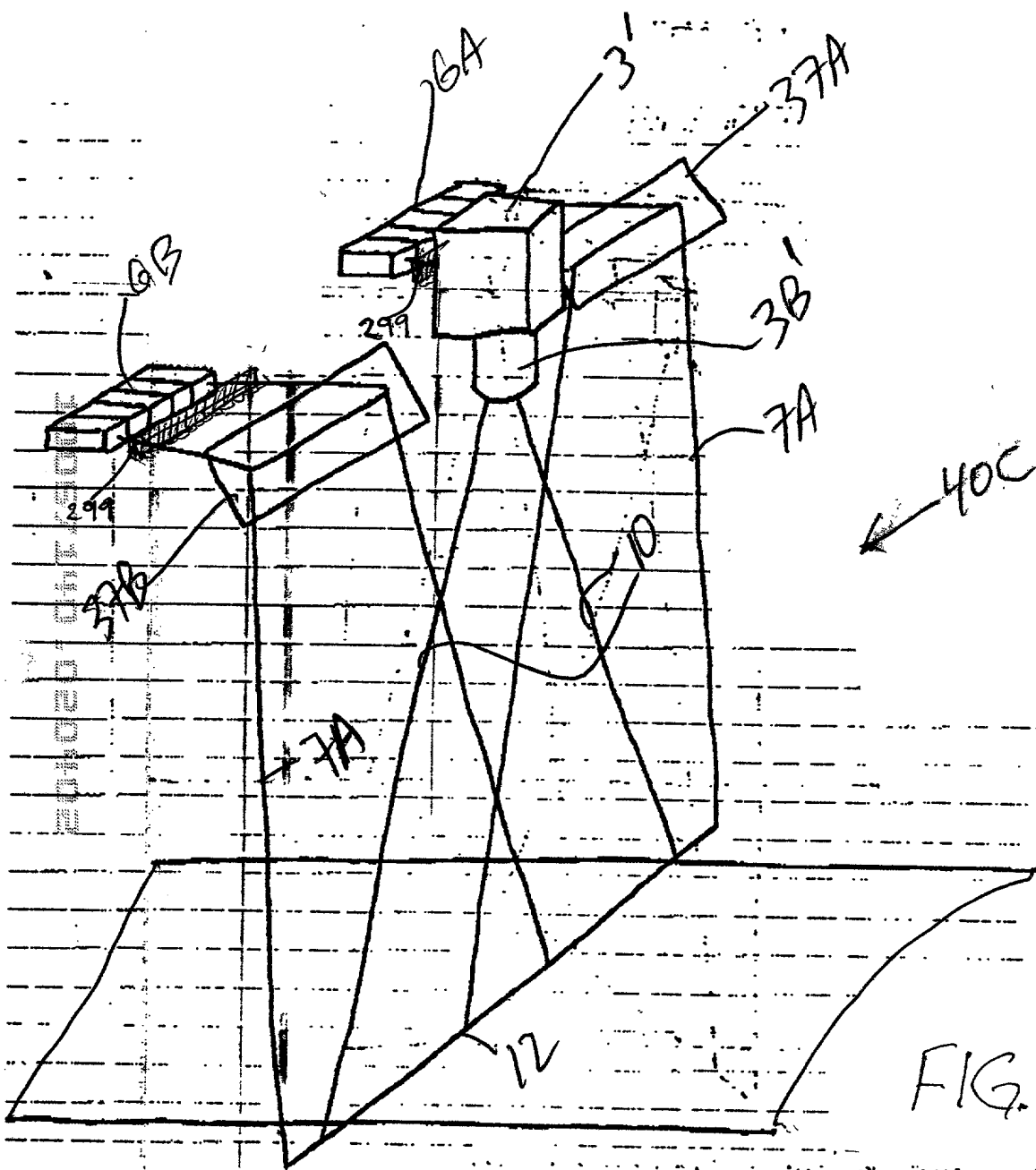


FIG. 2E1

FIG. 2E2

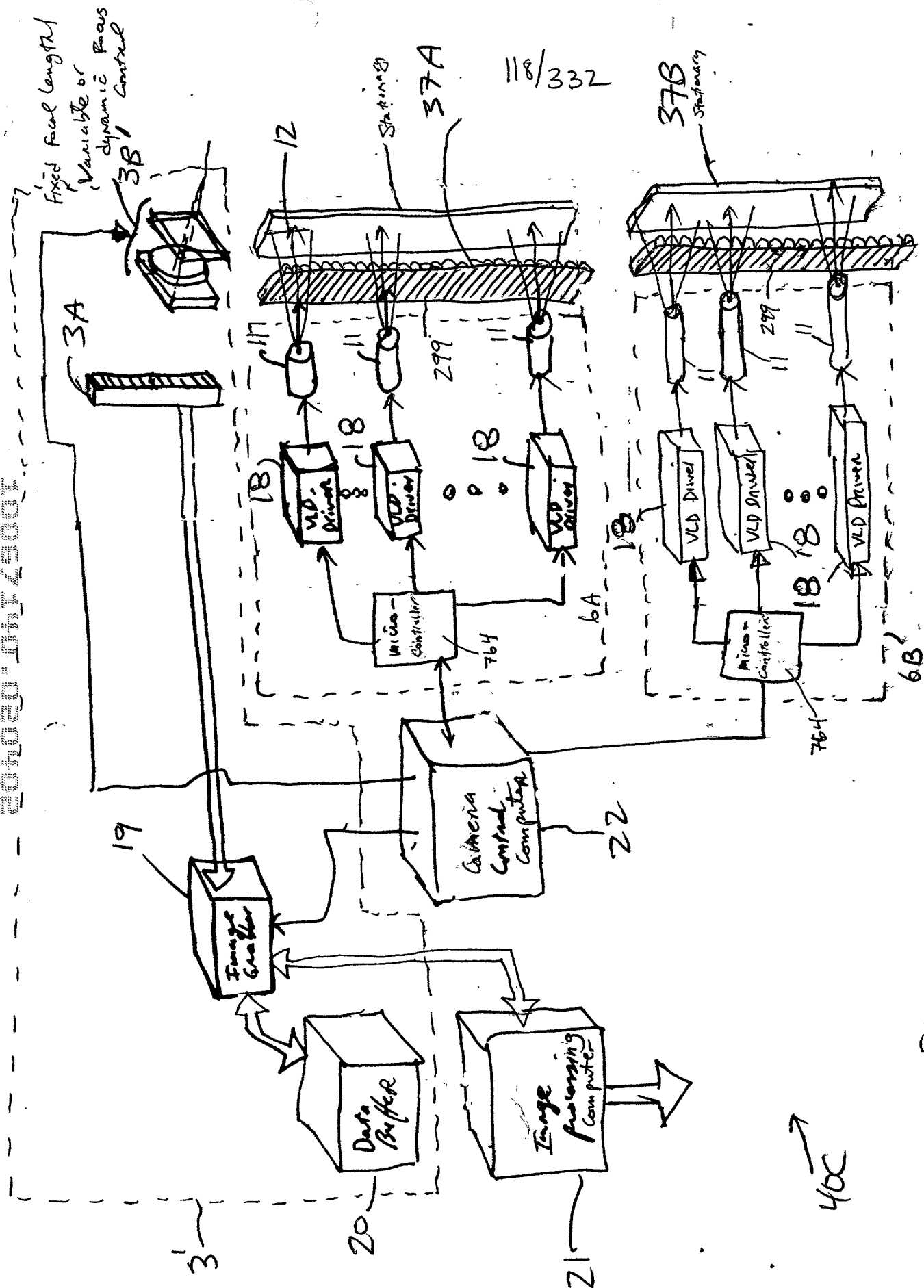


FIG. 2E2

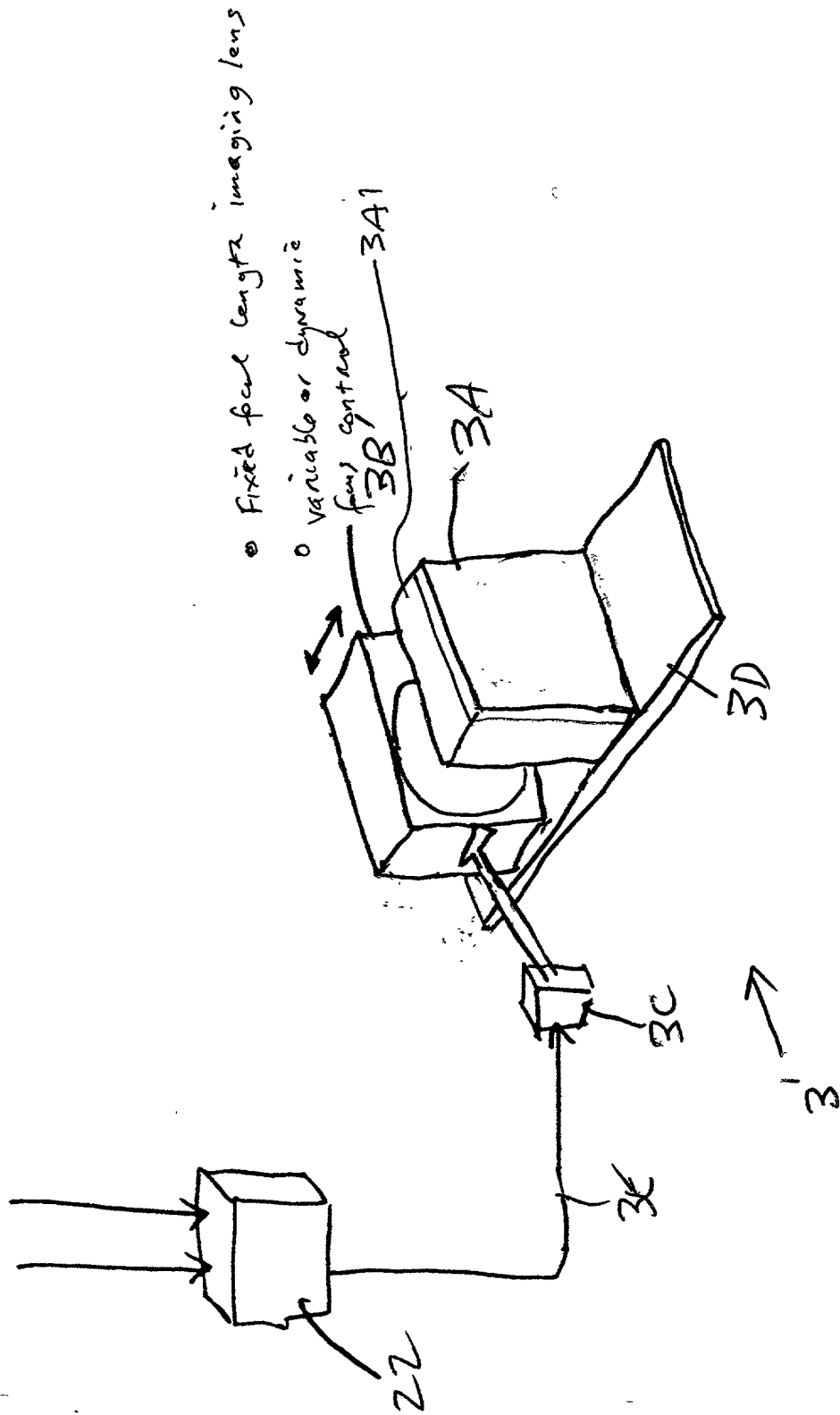


FIG. 2E3

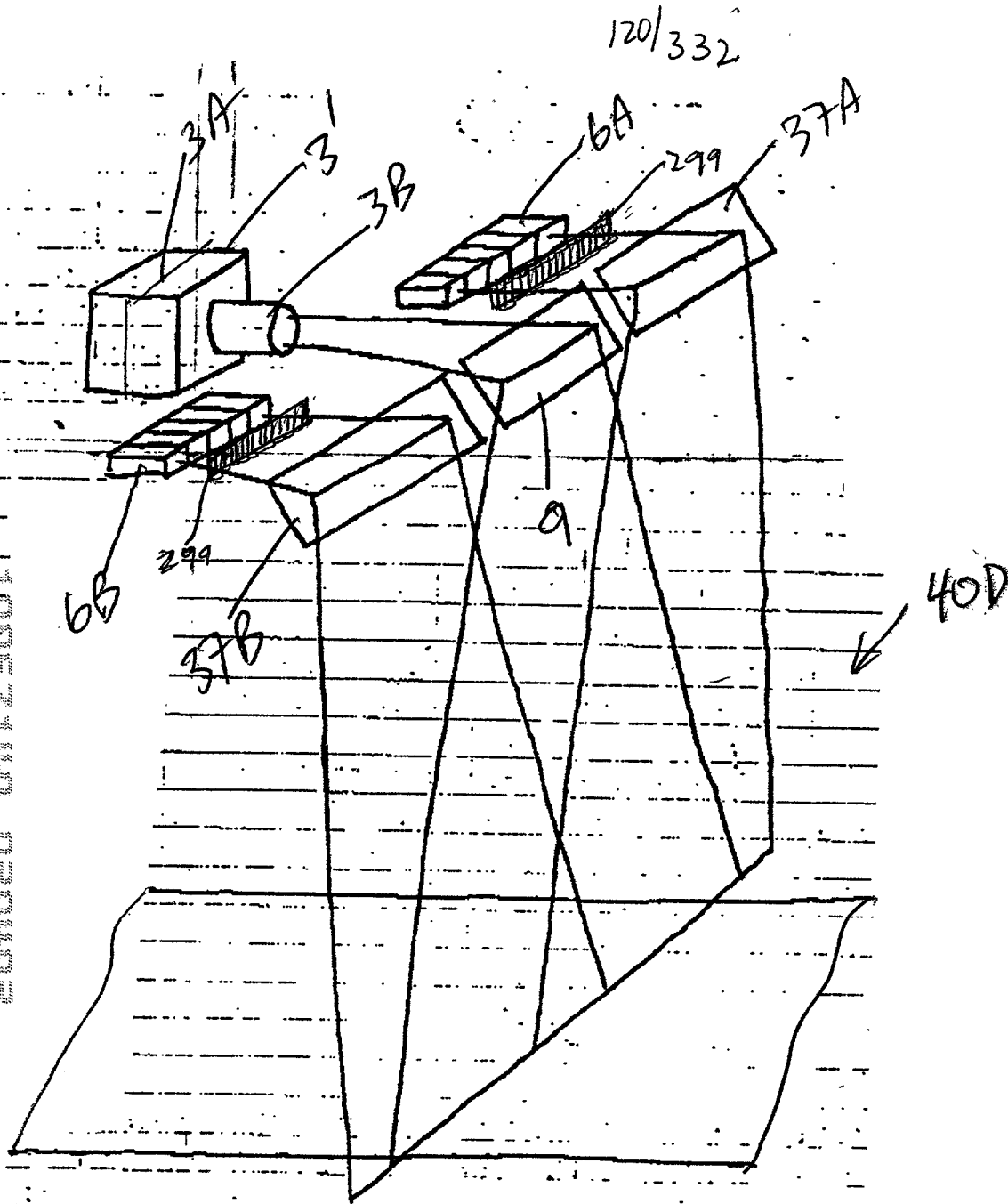


FIG. 2F1

FIG. 2F2

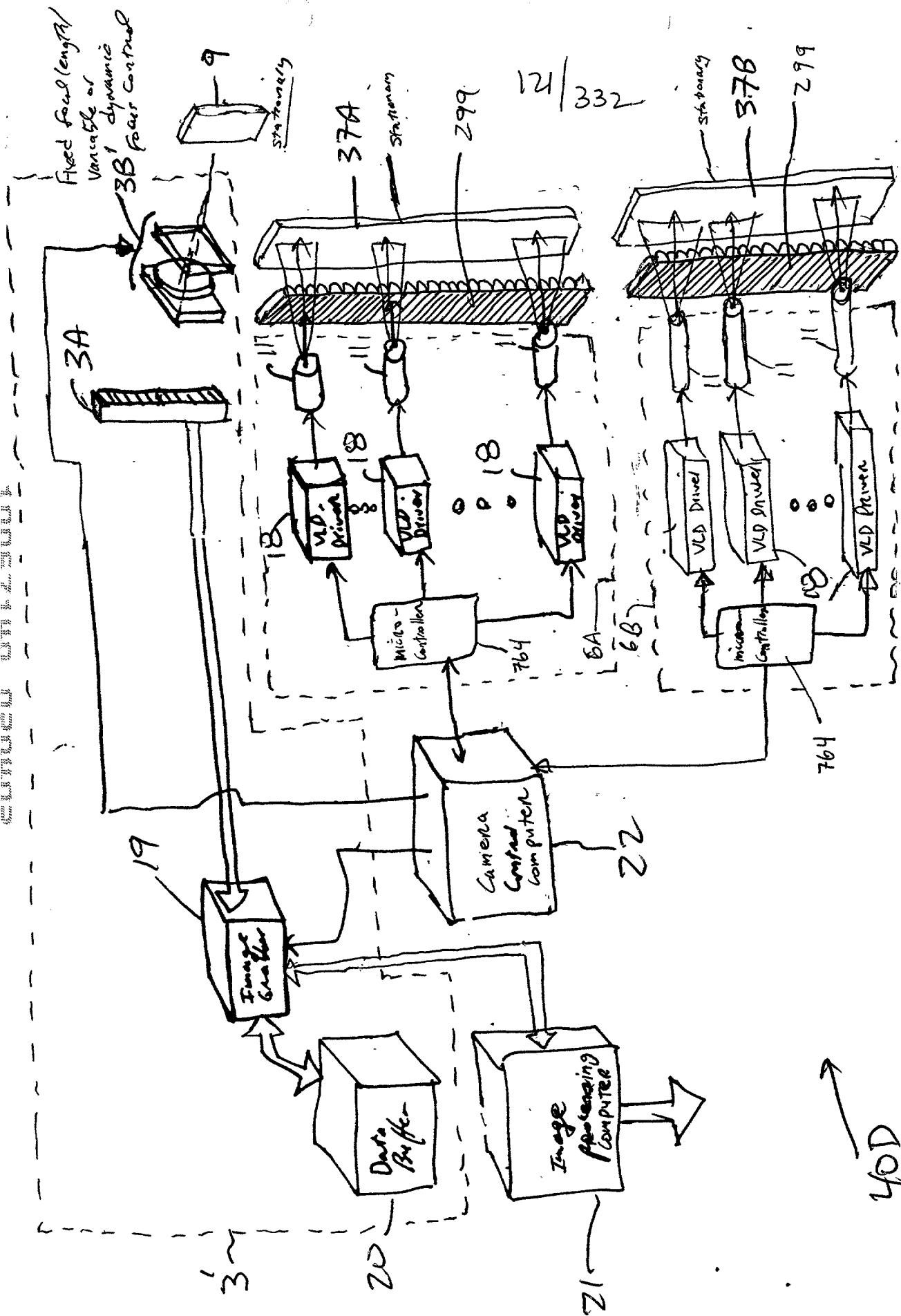


FIG. 2F2

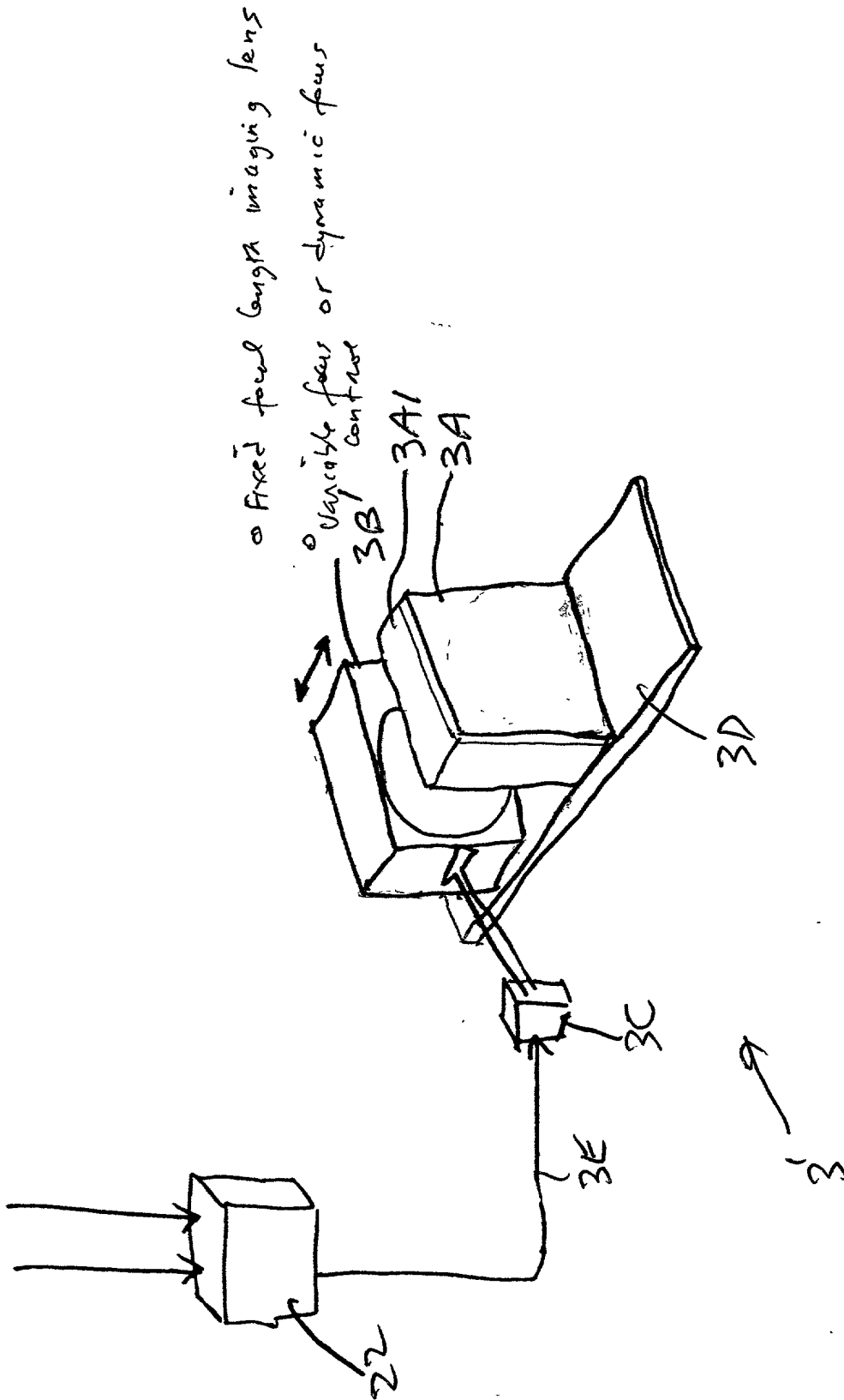


FIG. 2F3

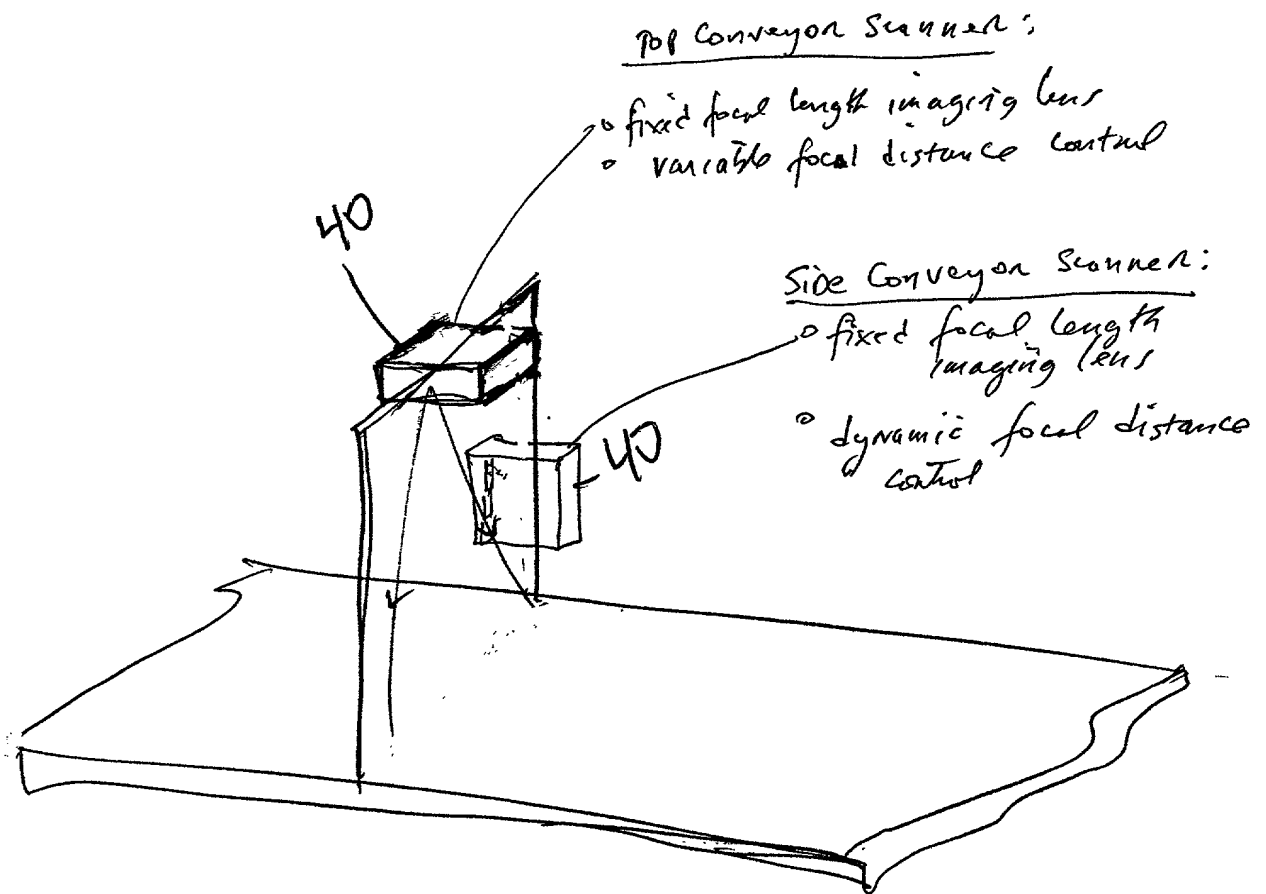


FIG. 2G

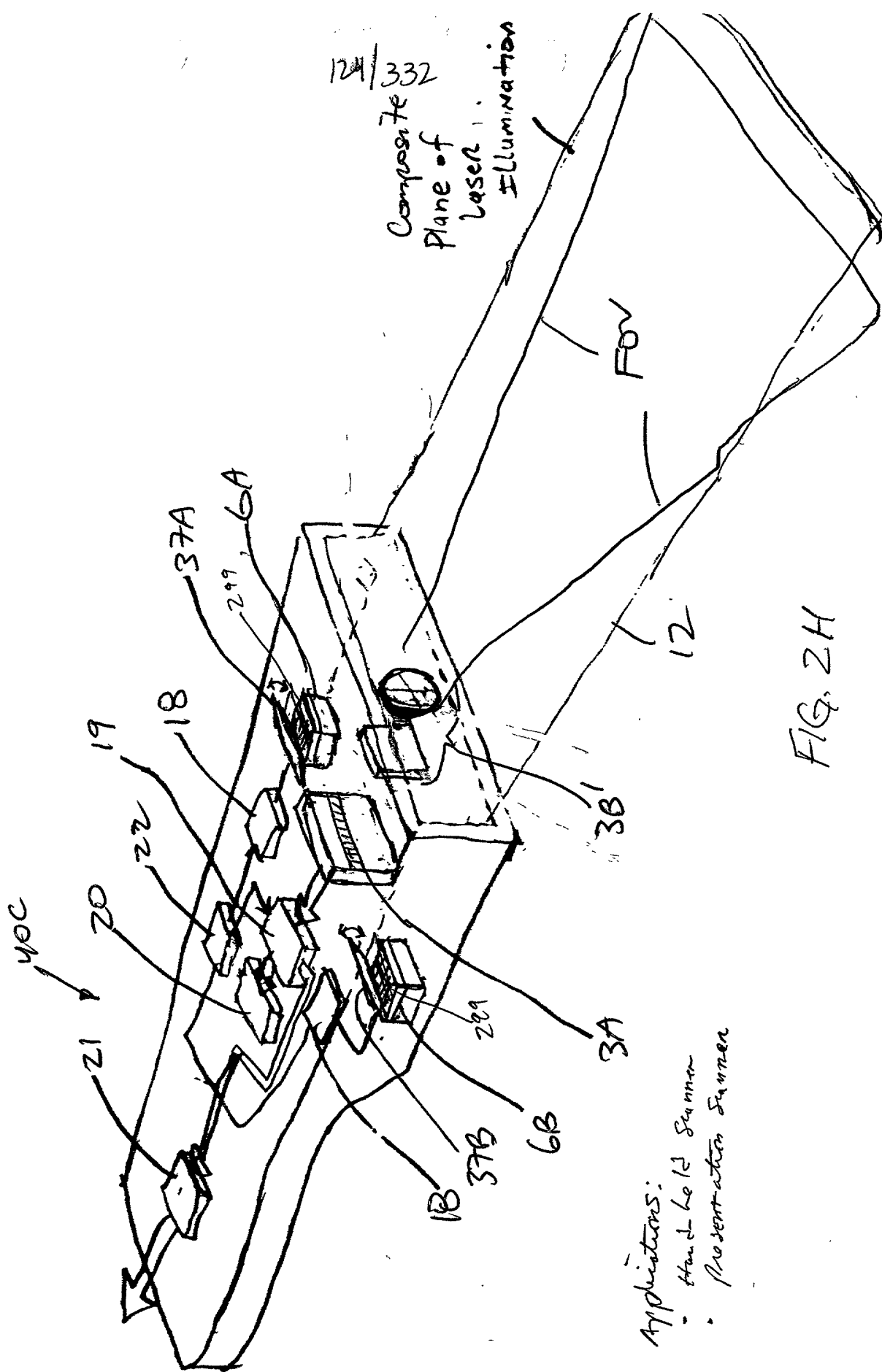


FIG. 2H

Applications:
• Hand held Scanner
• Presentation Scanner

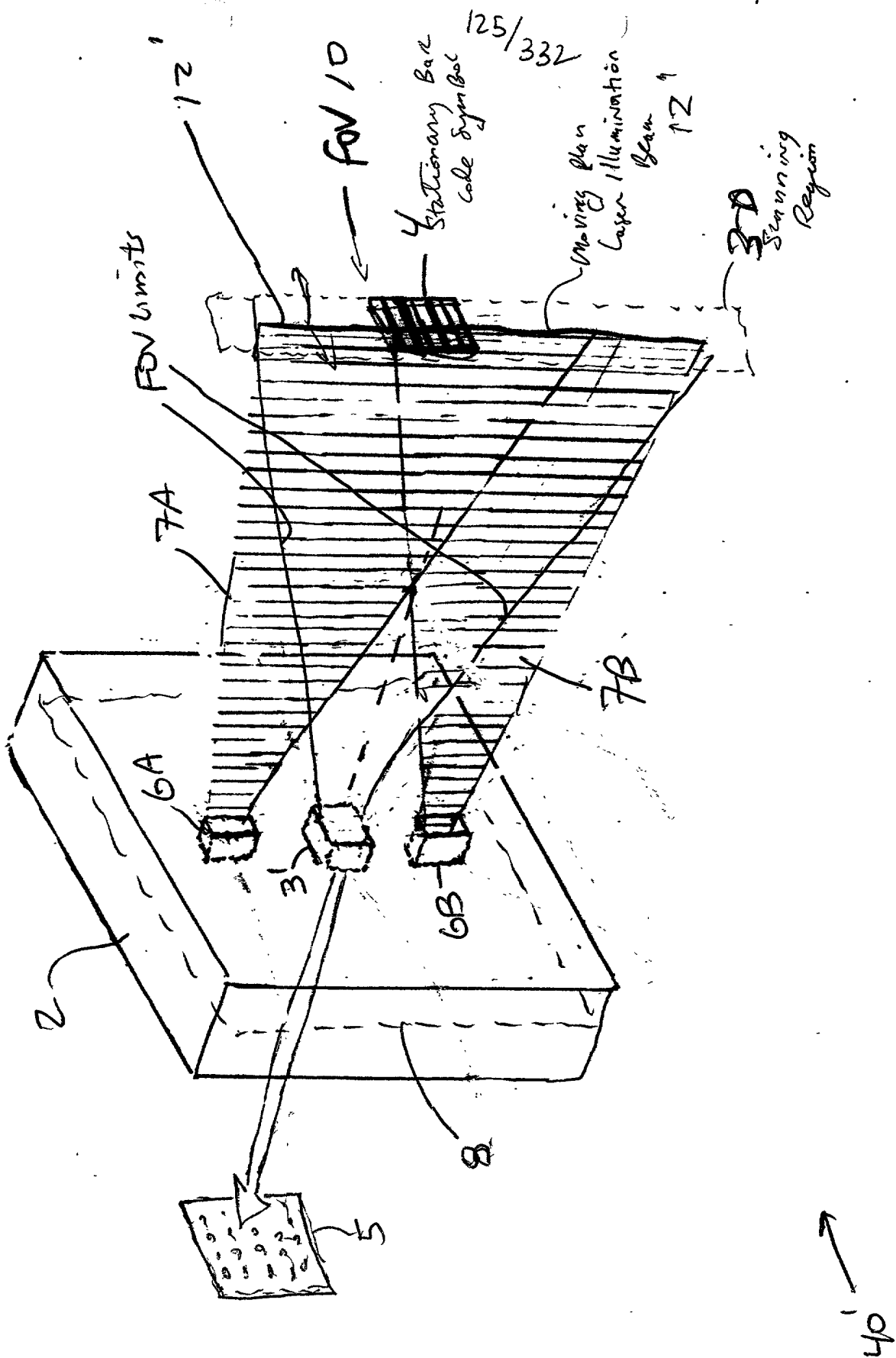


FIG. 2II

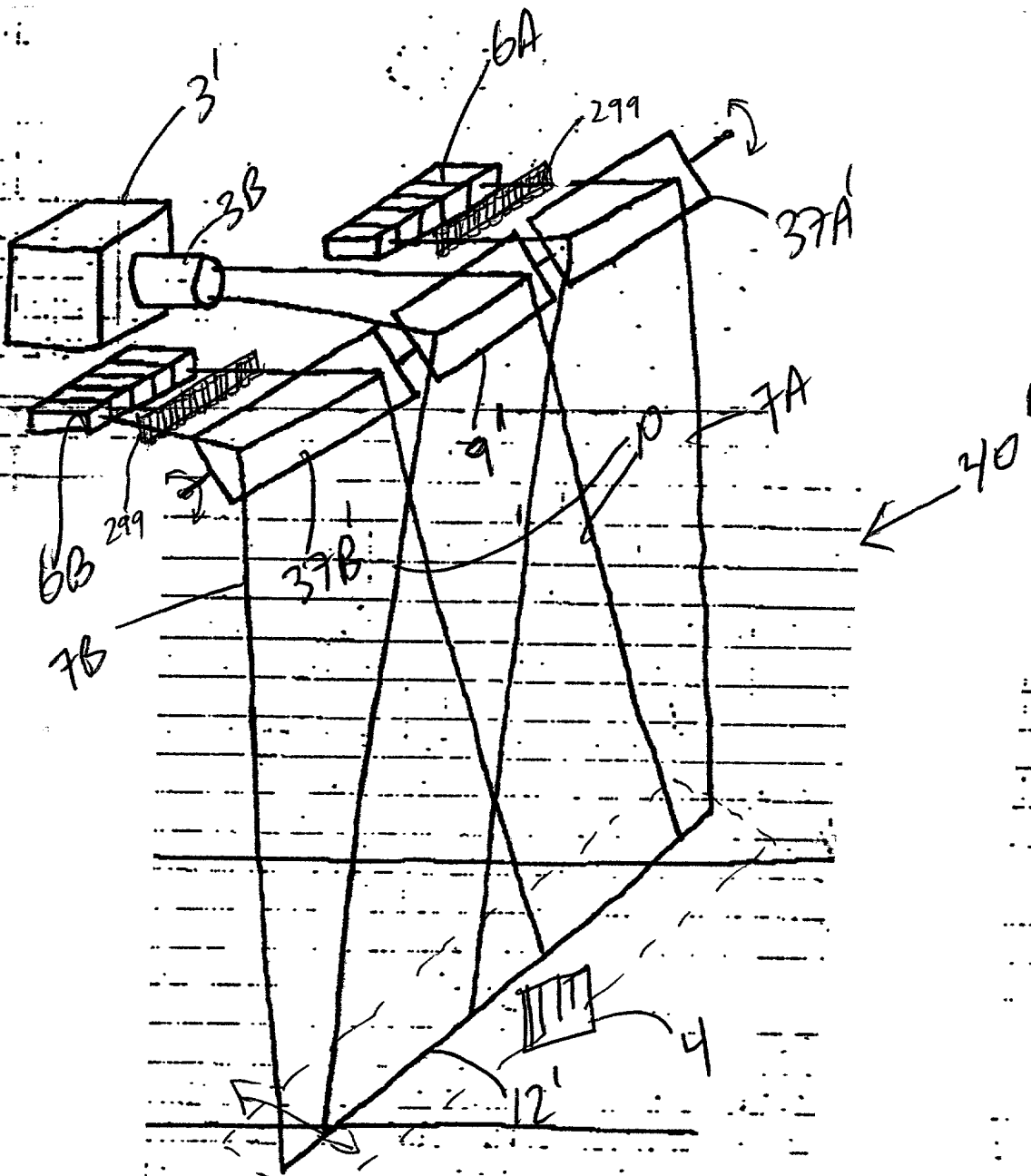
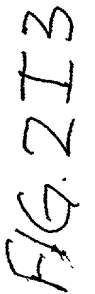


FIG 2I2

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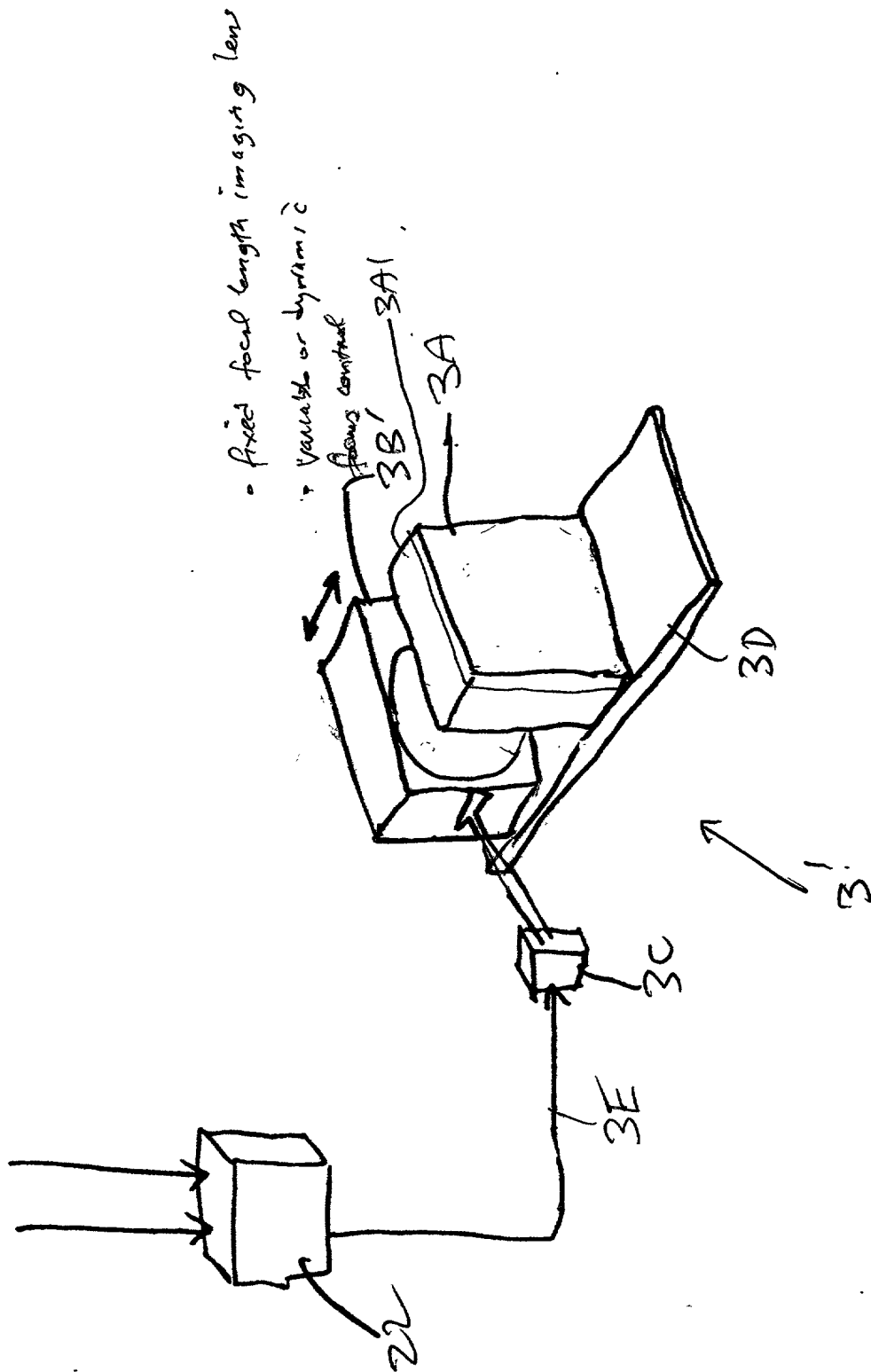


FIG. 2I4

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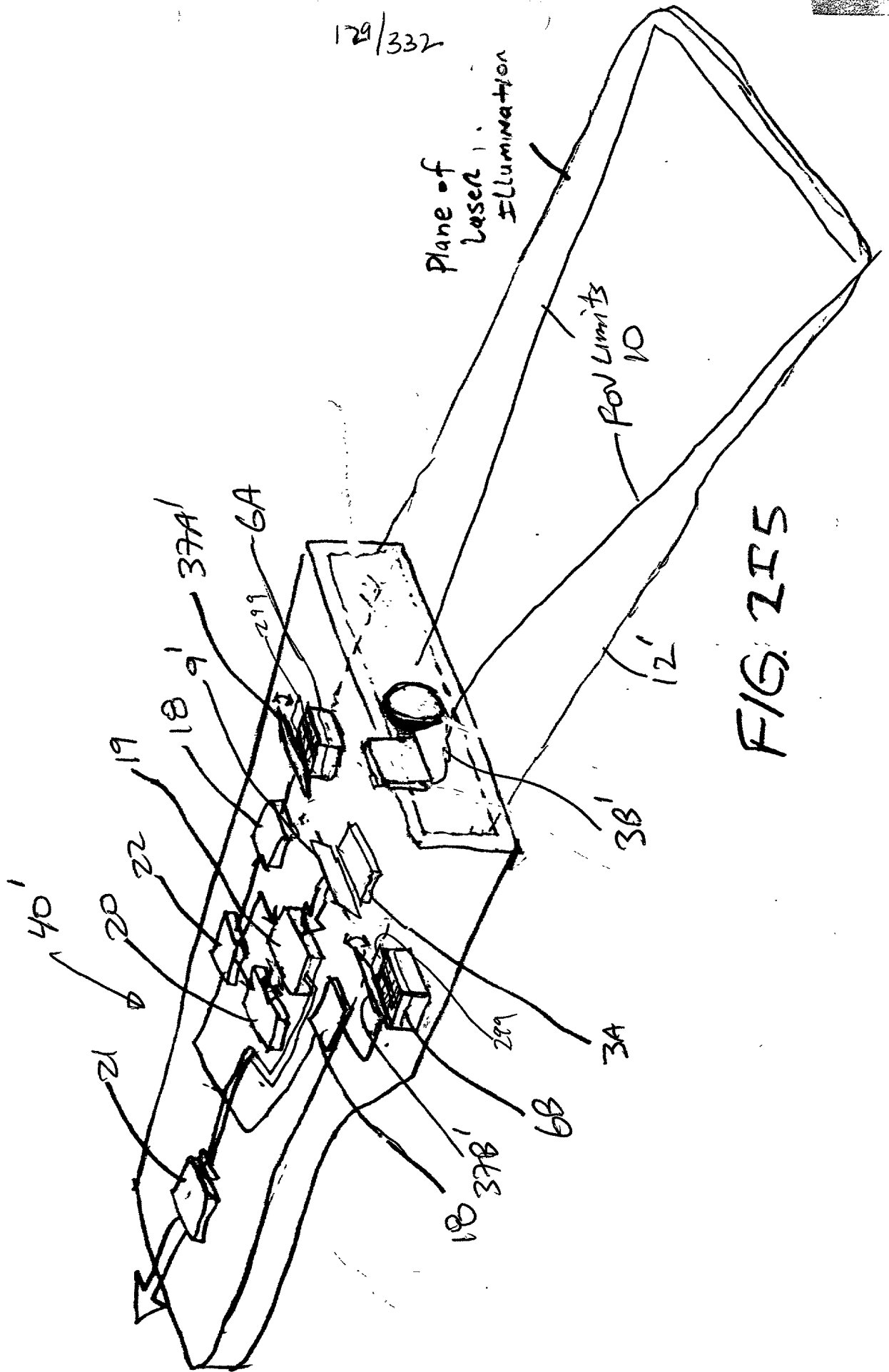


FIG. 215

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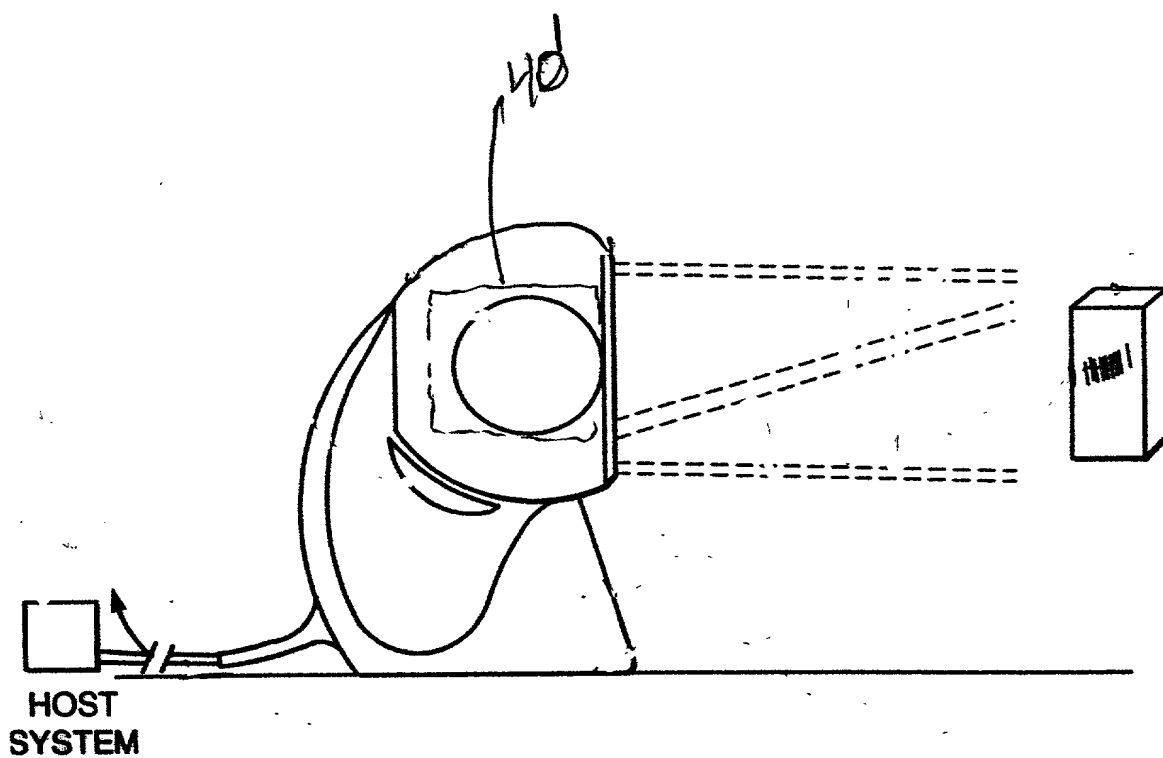


FIG. 2I6

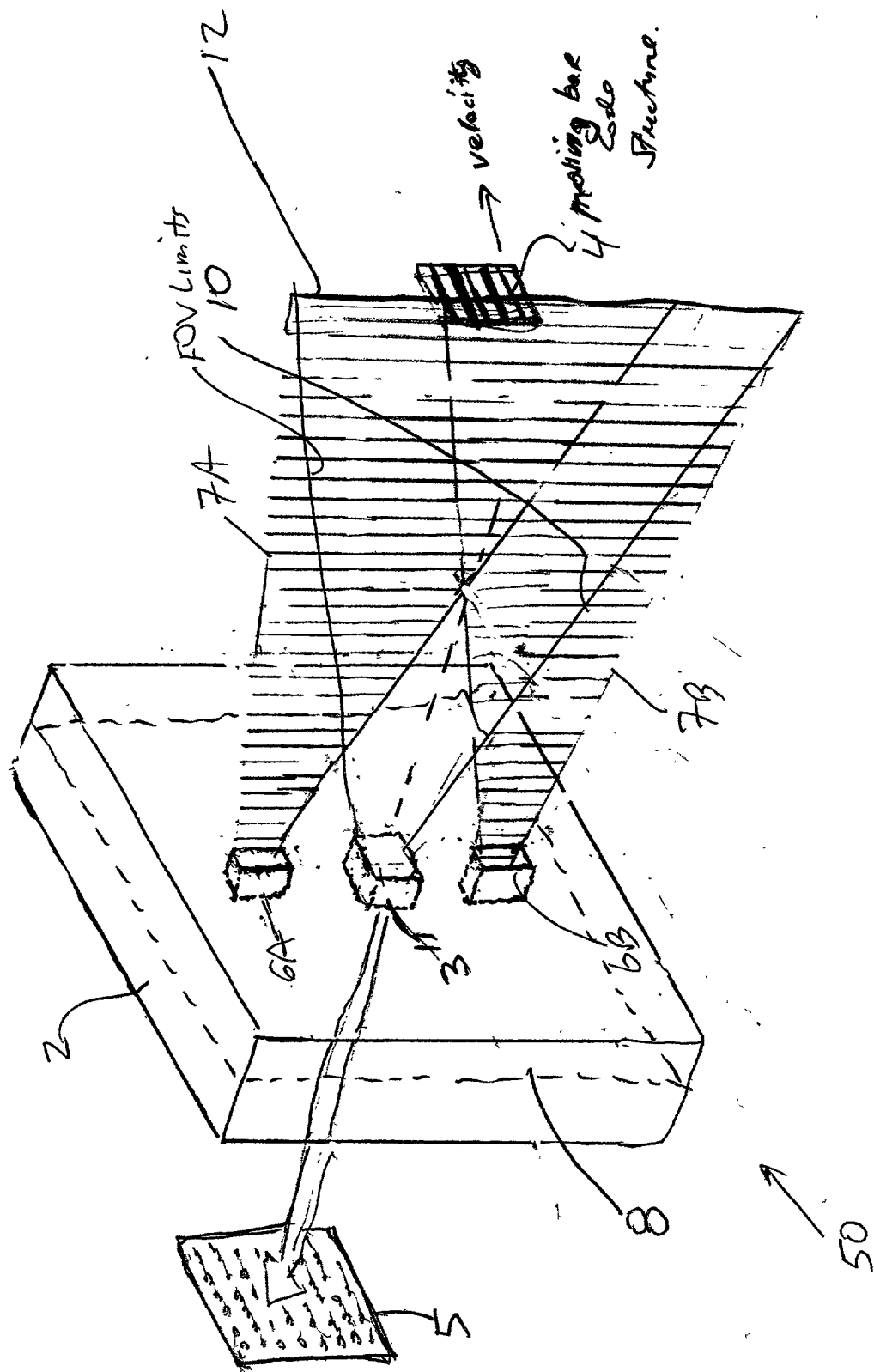


FIG 3A

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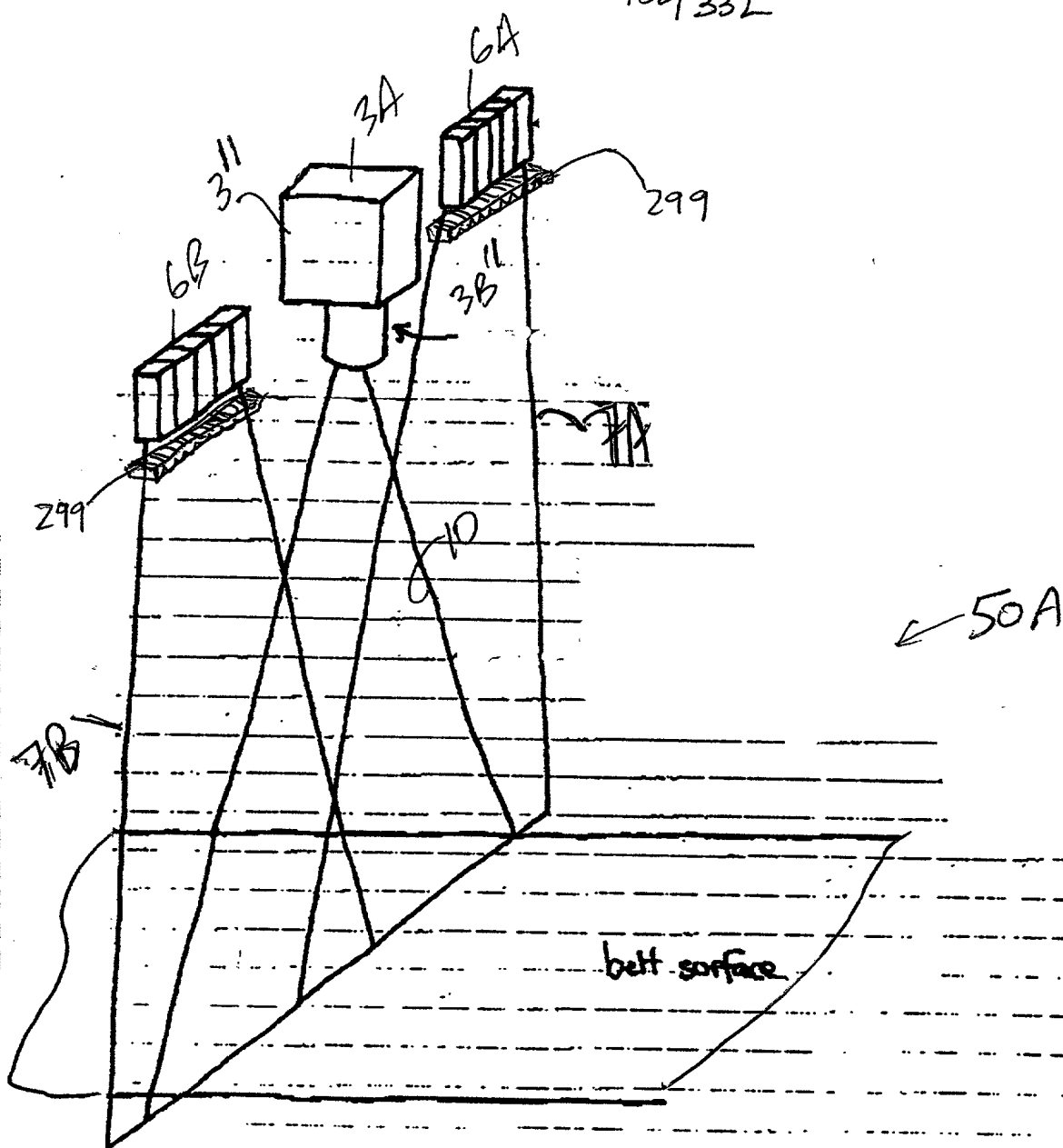


FIG. 3B1



Wandering

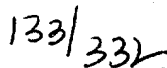


FIG. 382

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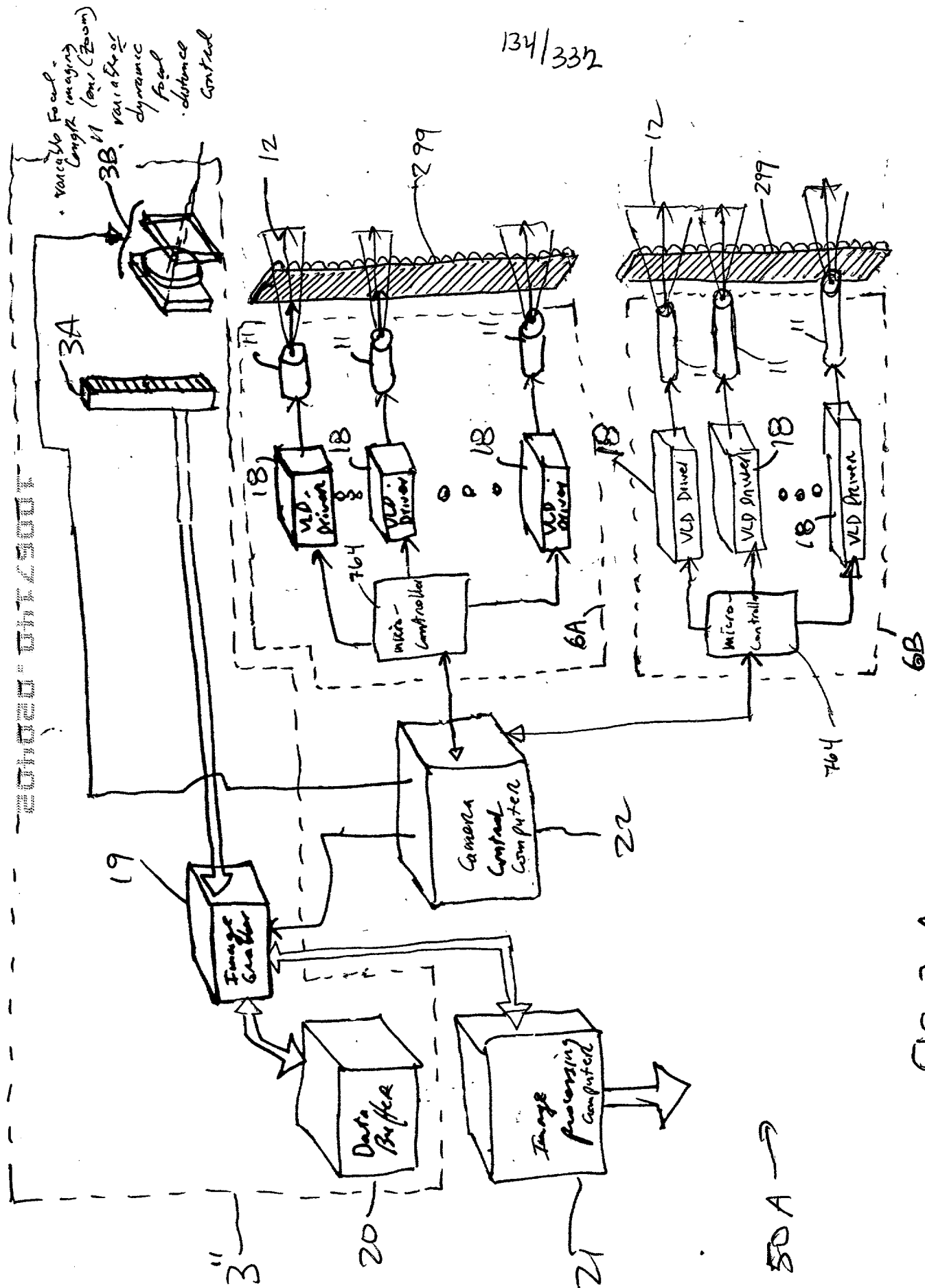
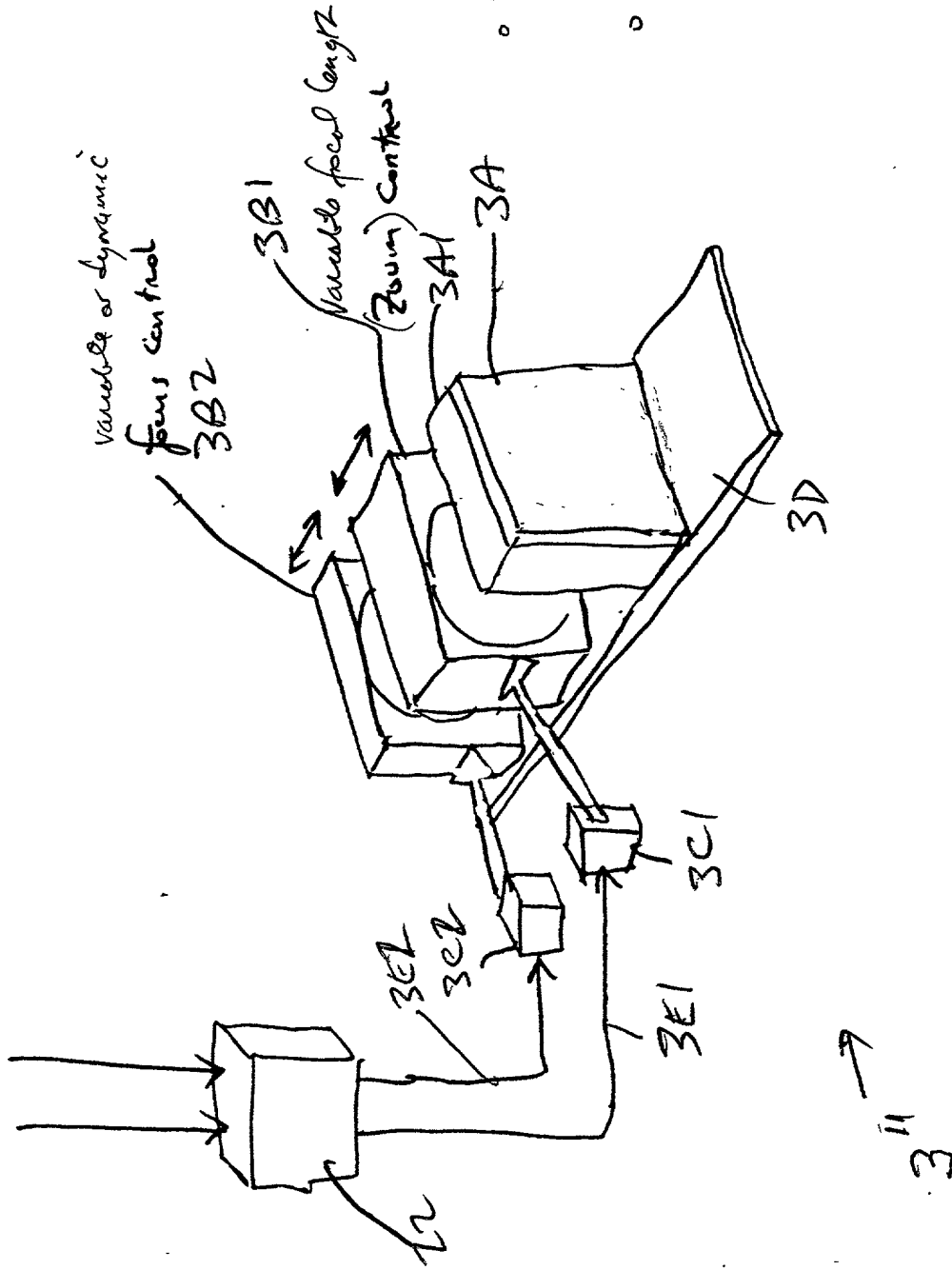


FIG 3C1

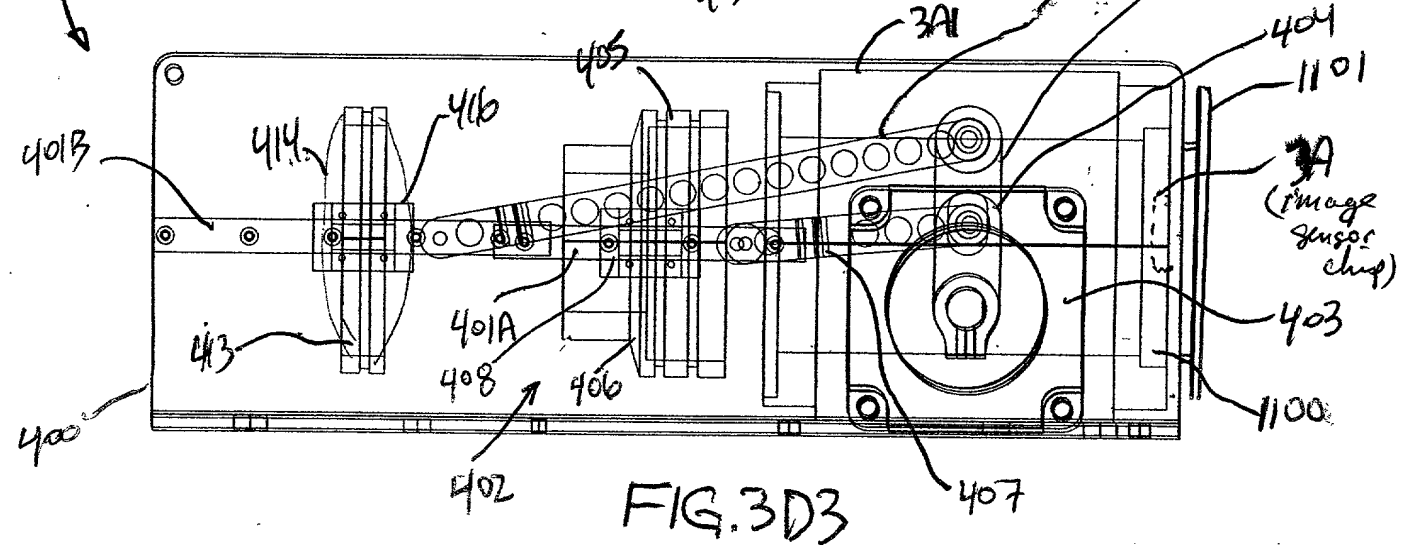
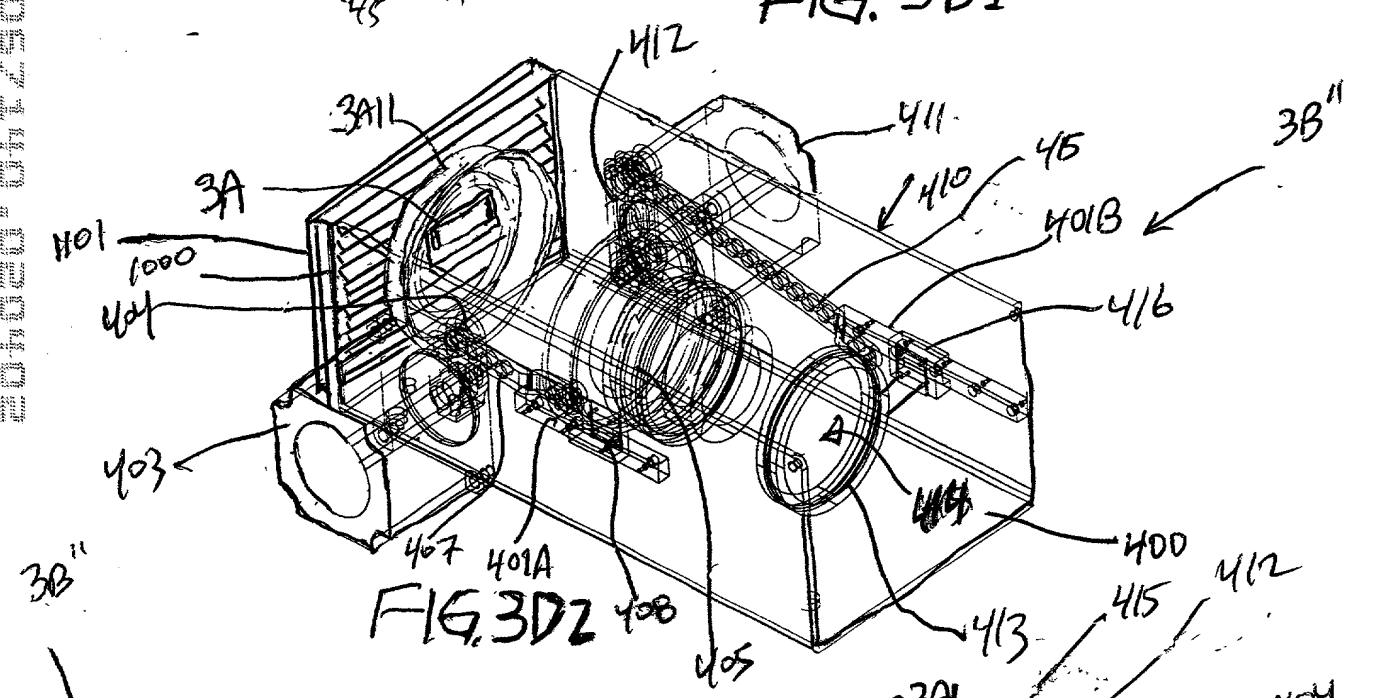
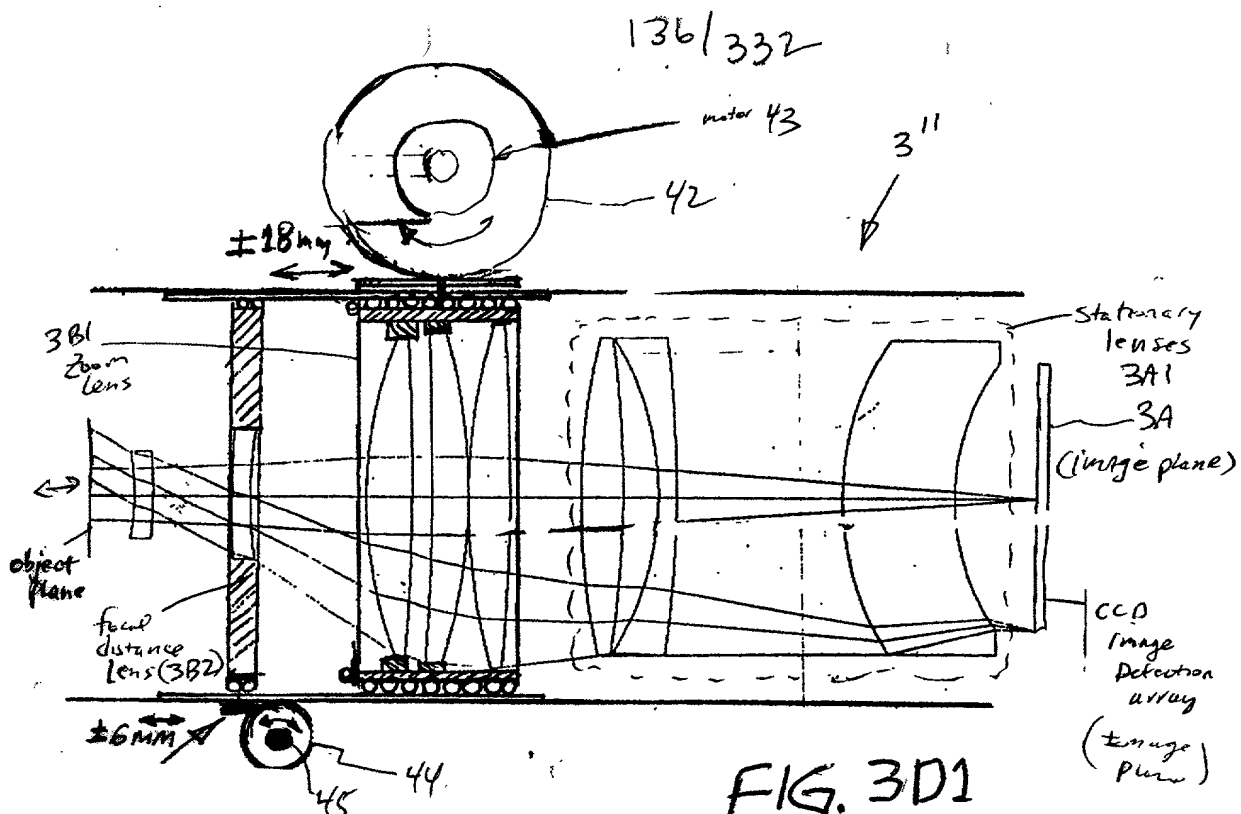
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- Variable focal length camera lens
- Variable focal distance

FIG. 3CZ

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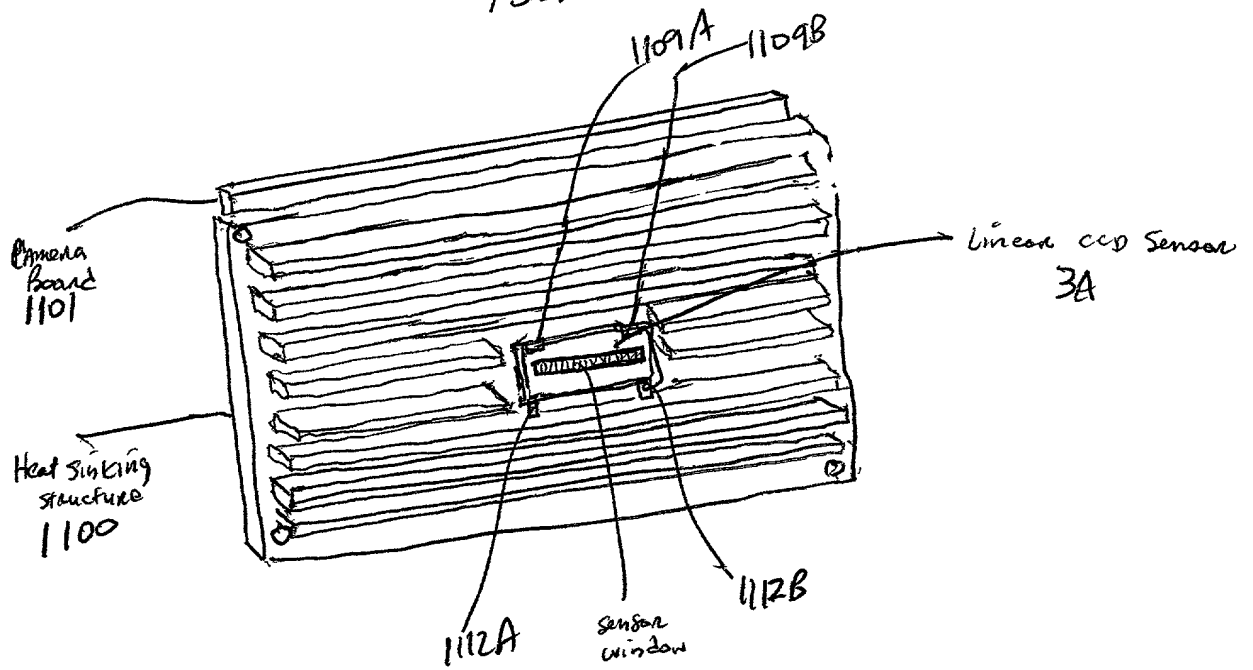


FIG. 3D4

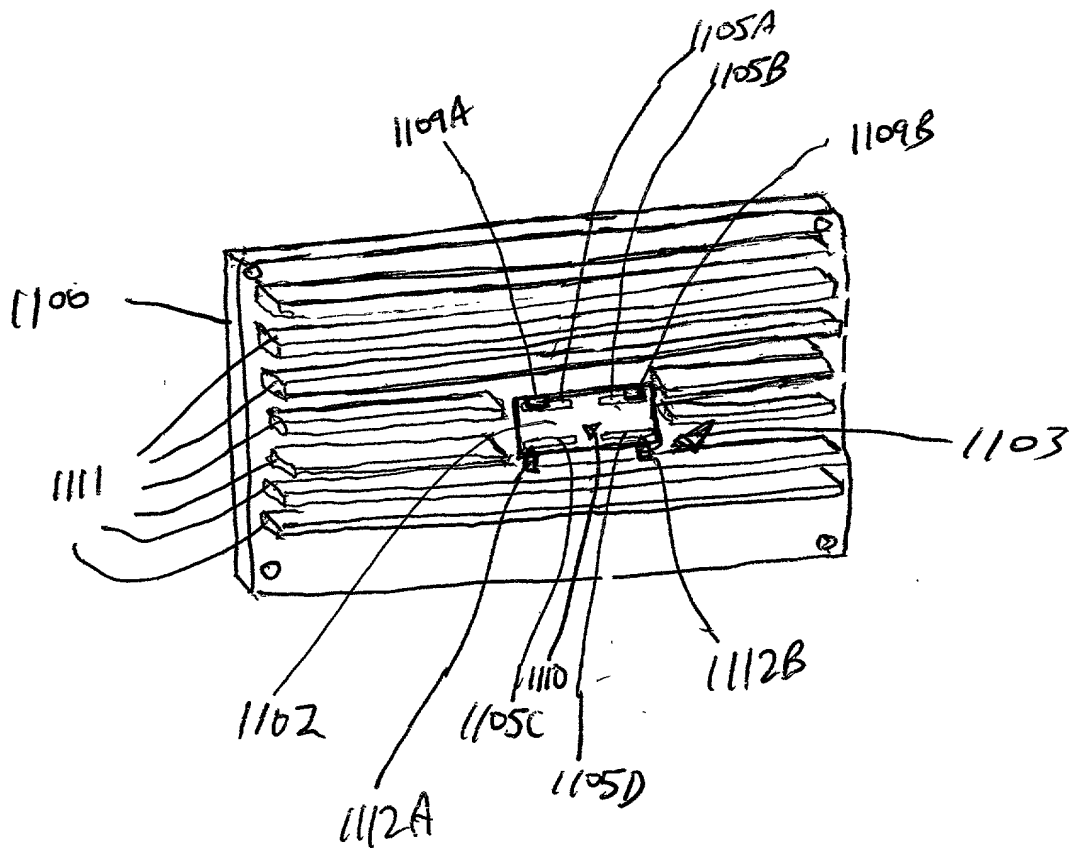


FIG. 3D5

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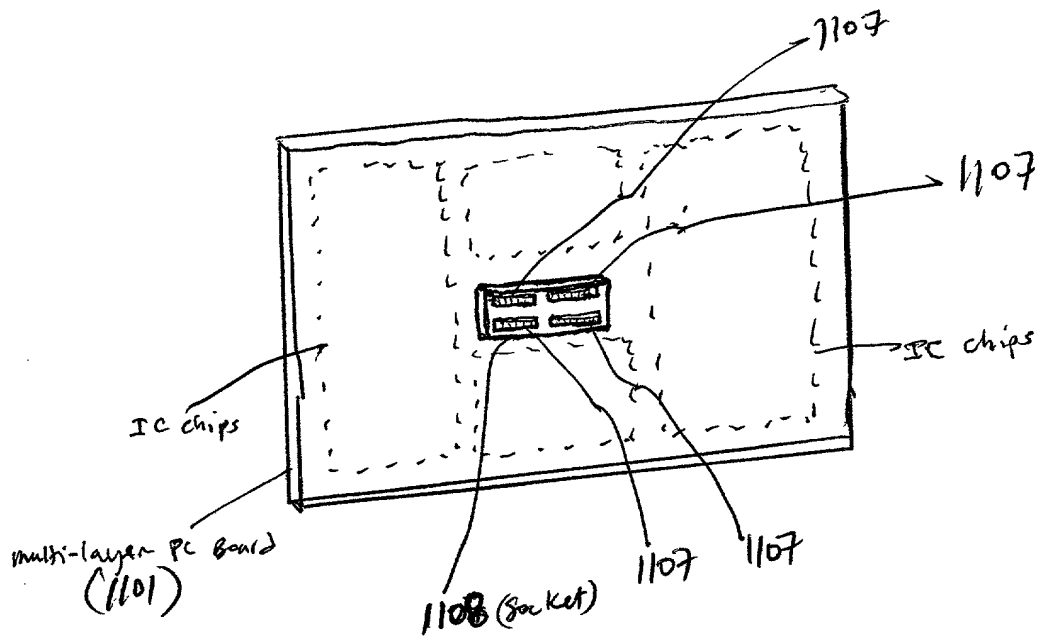


FIG. 3D6

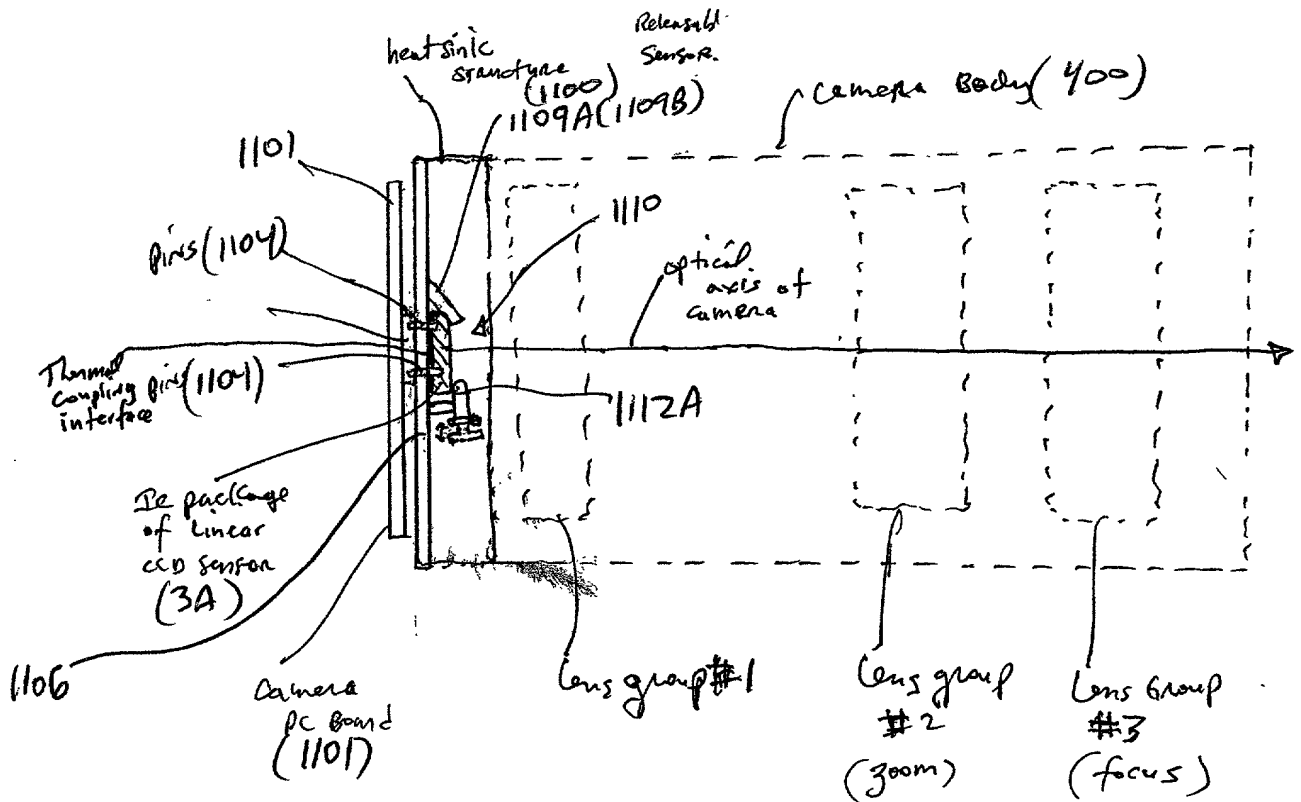
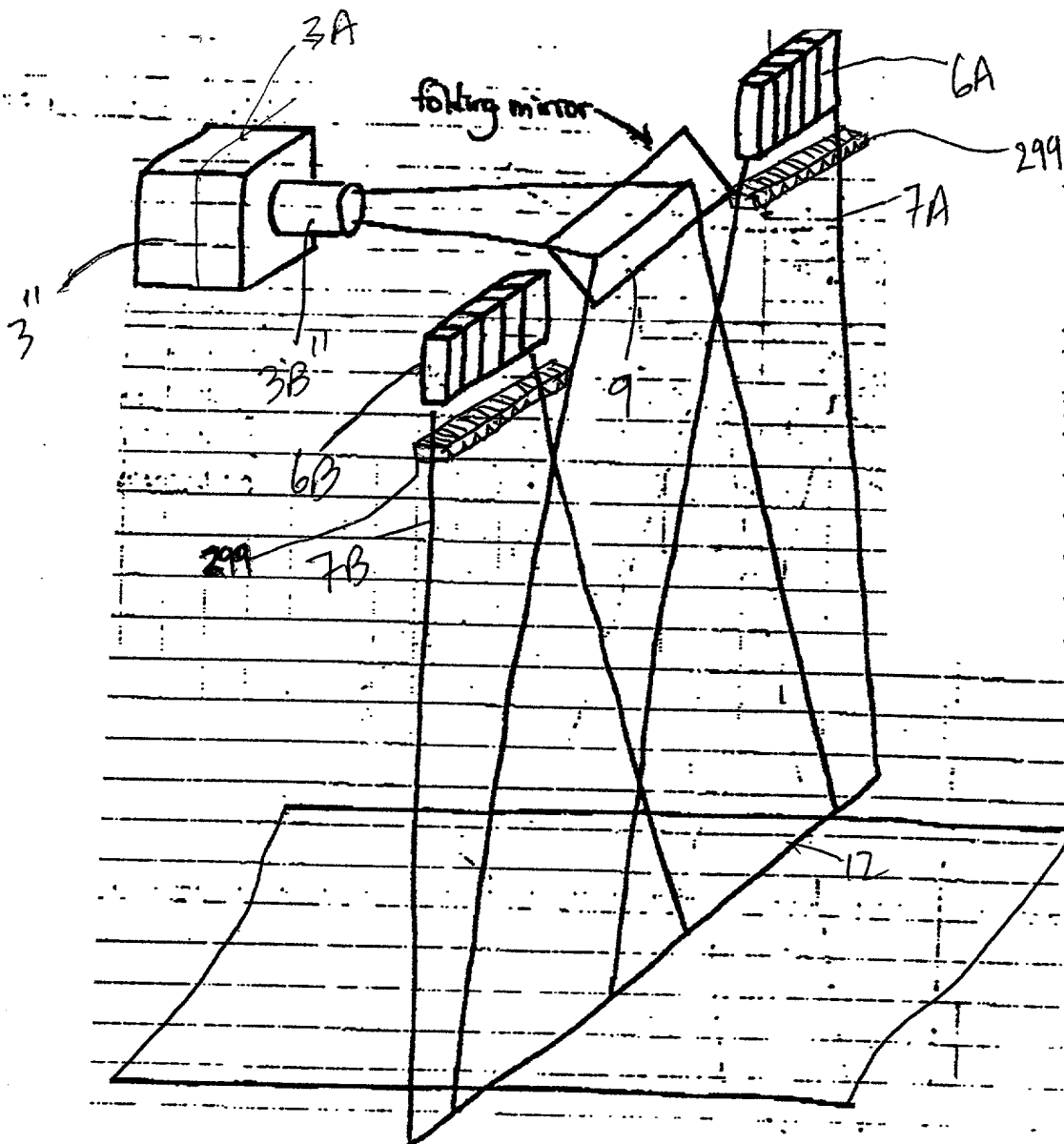


FIG. 3D7

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FIG. 3E1

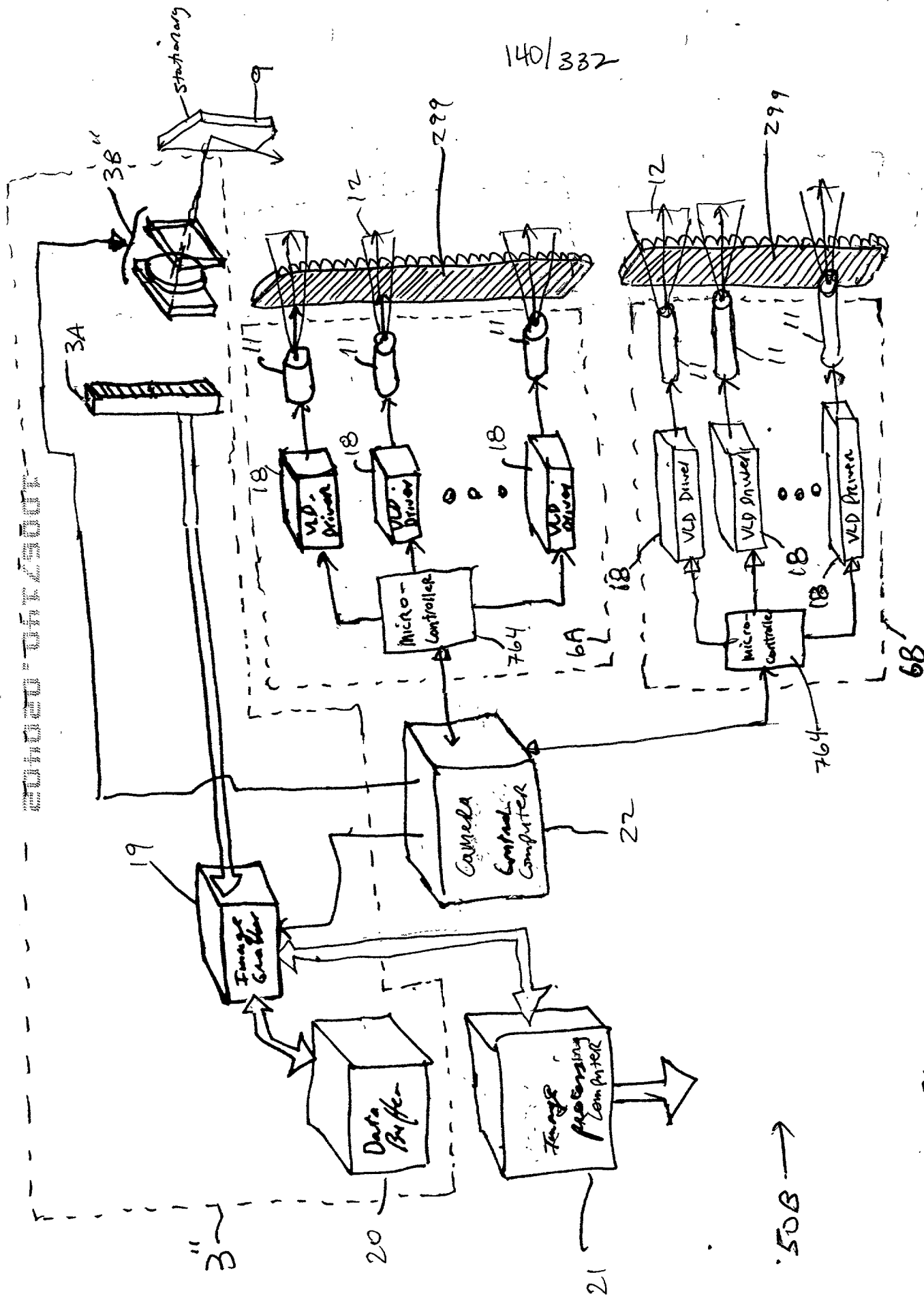
$$140 \mid 332$$


FIG. 3E2

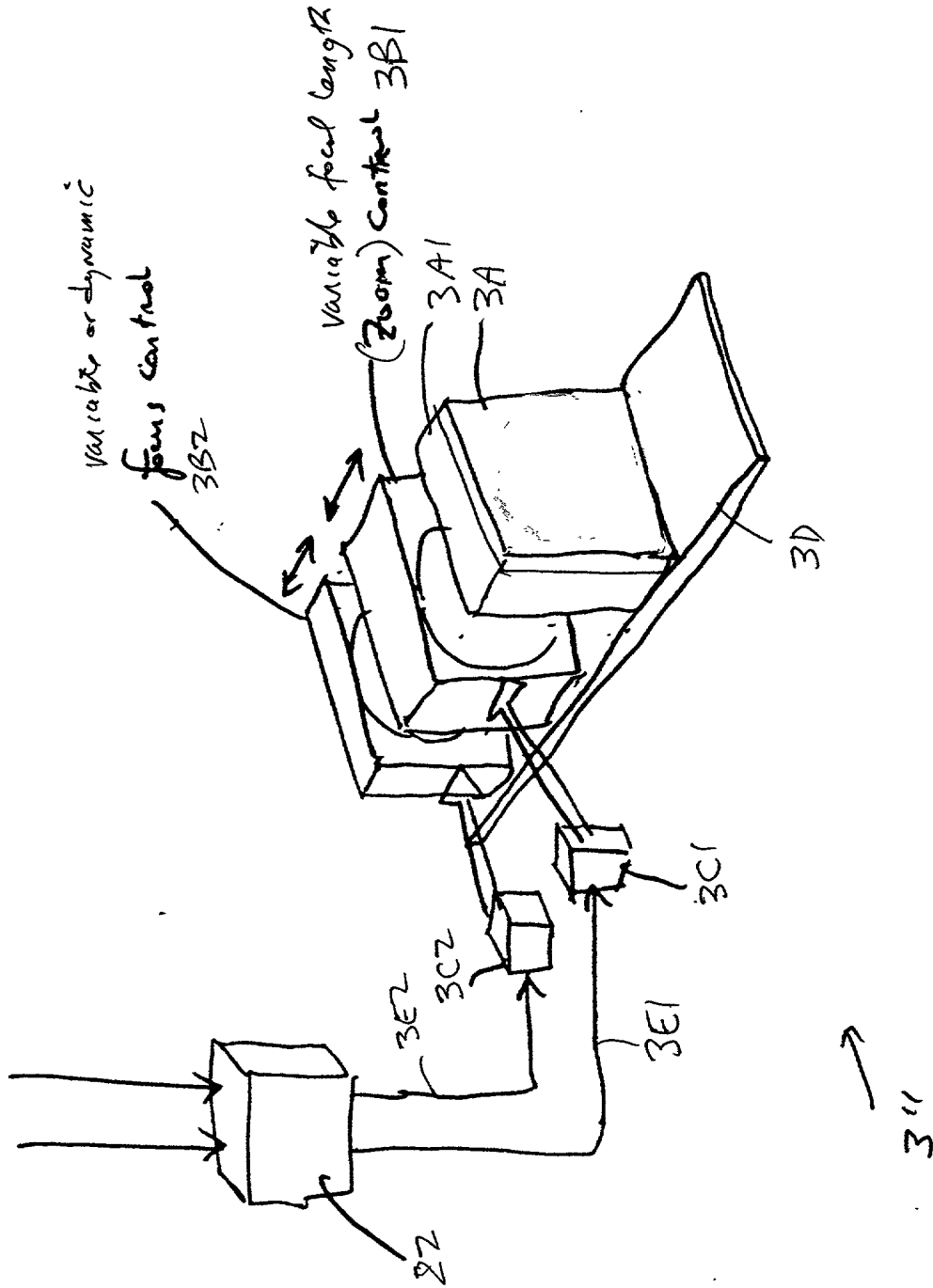
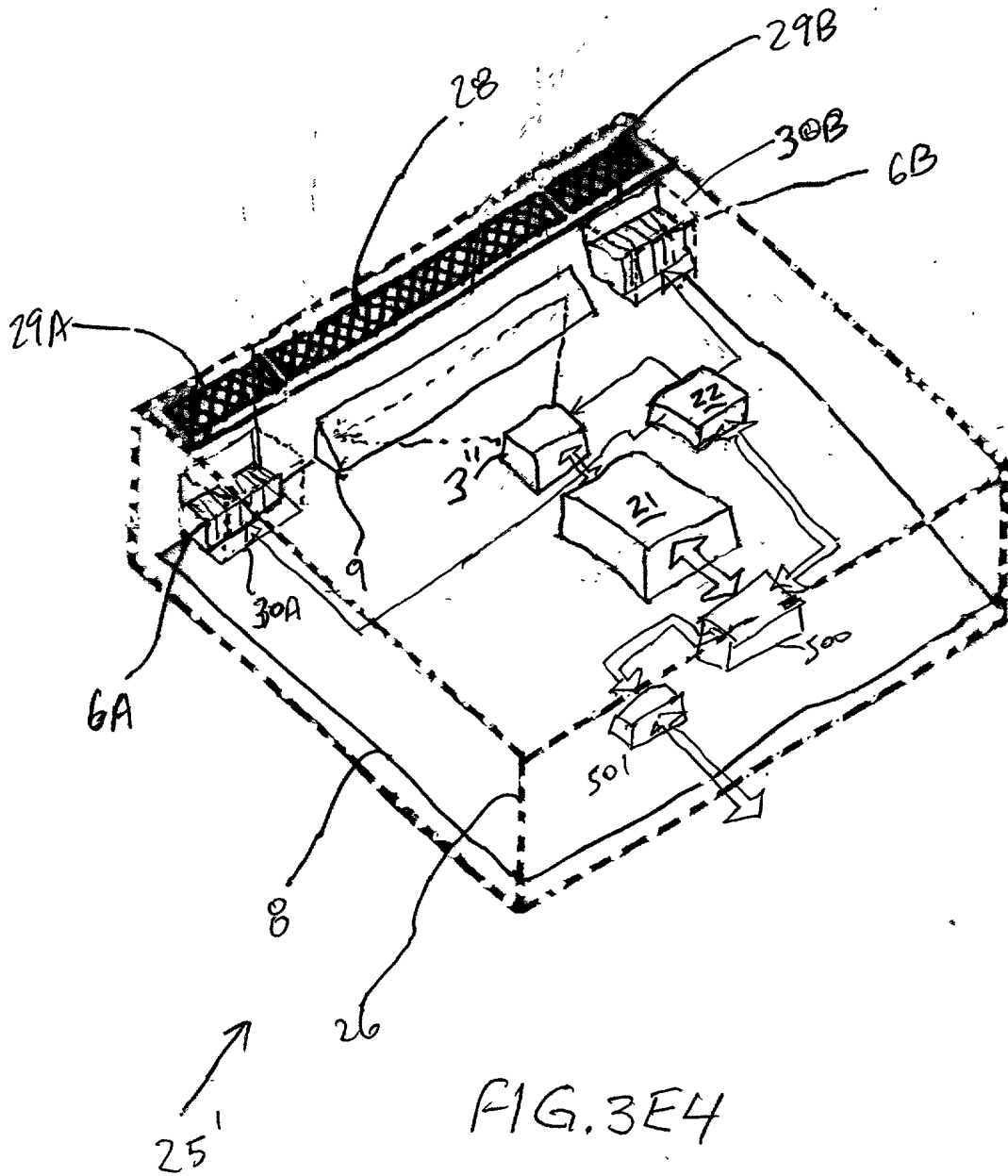


FIG. 3E3

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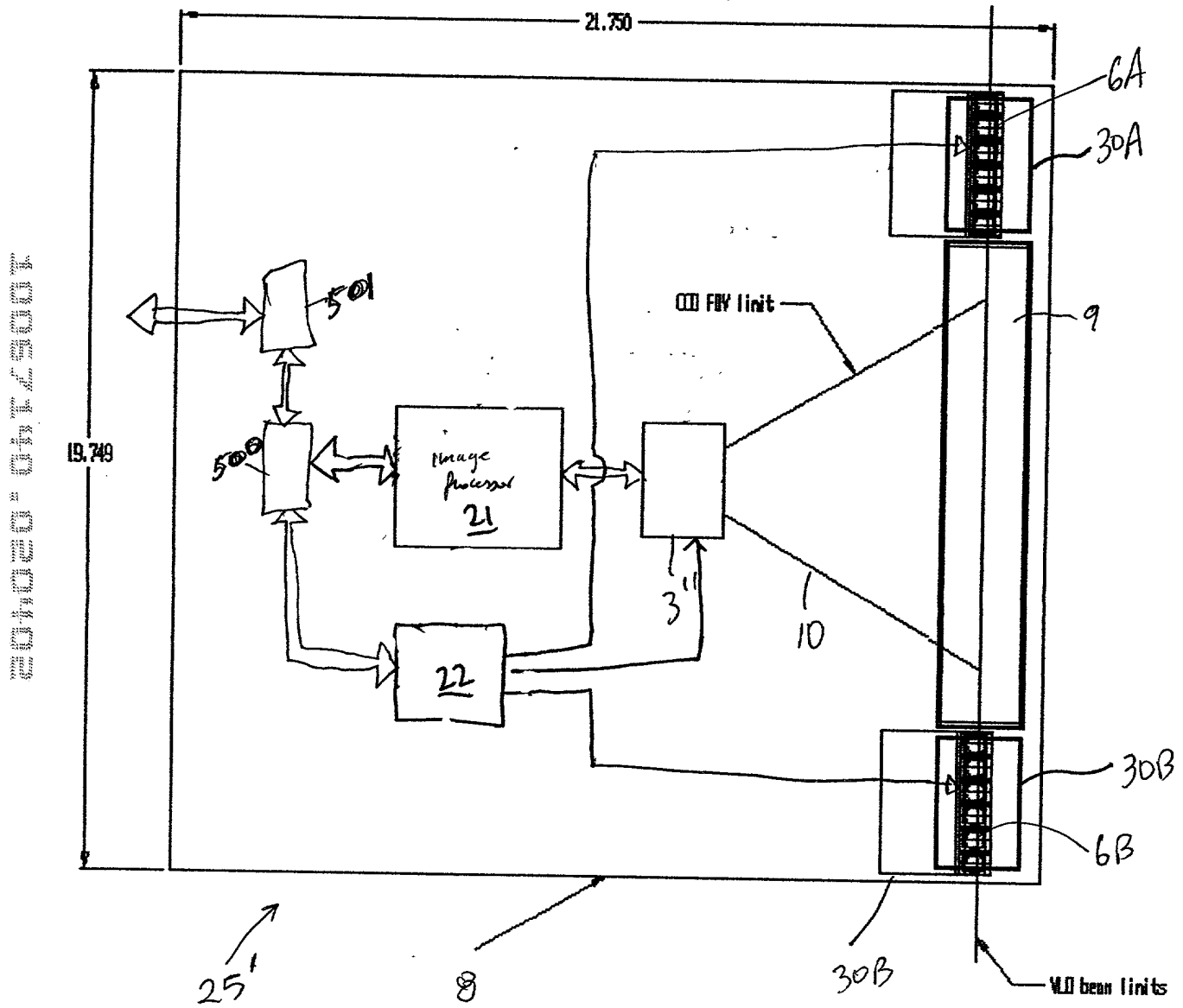


FIG. 3E5

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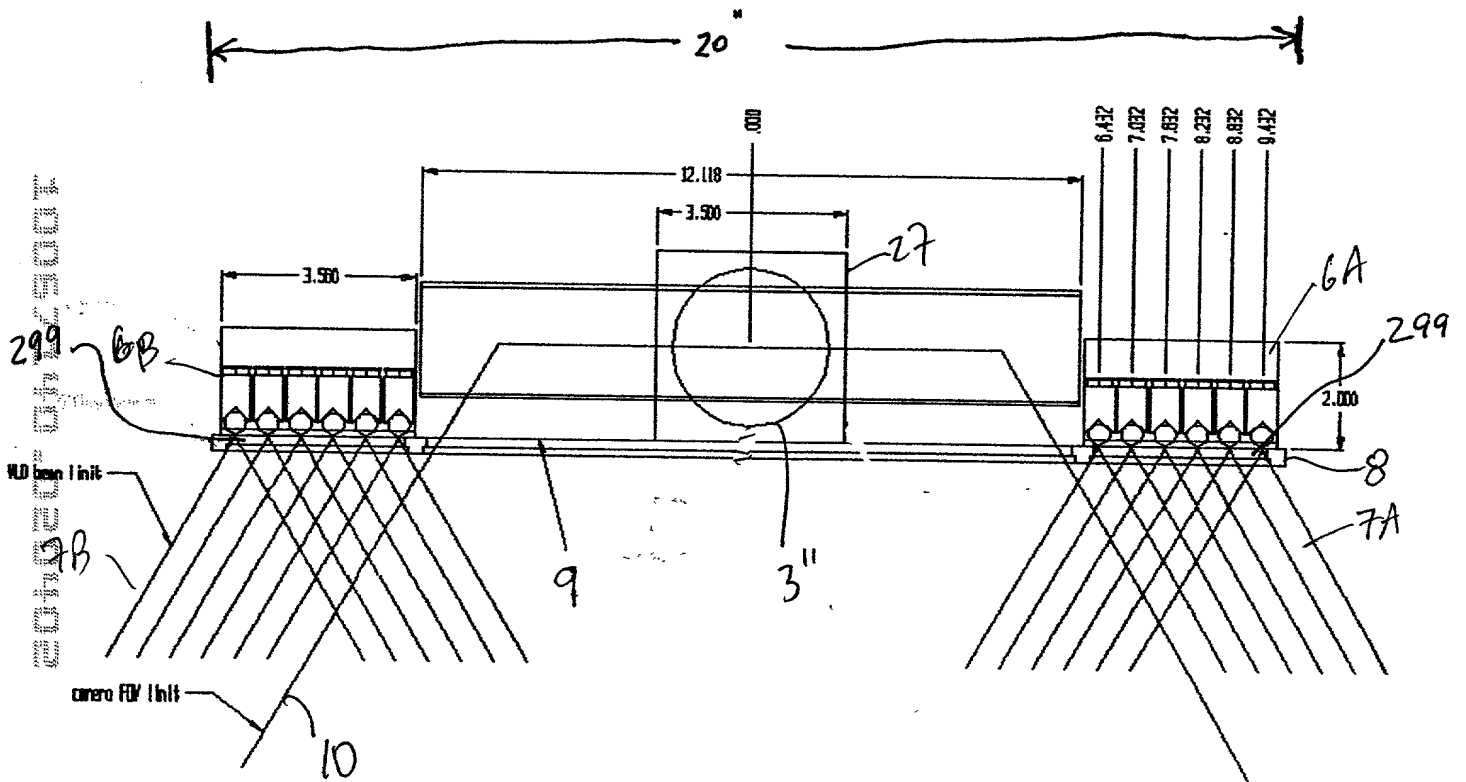


FIG. 3E6

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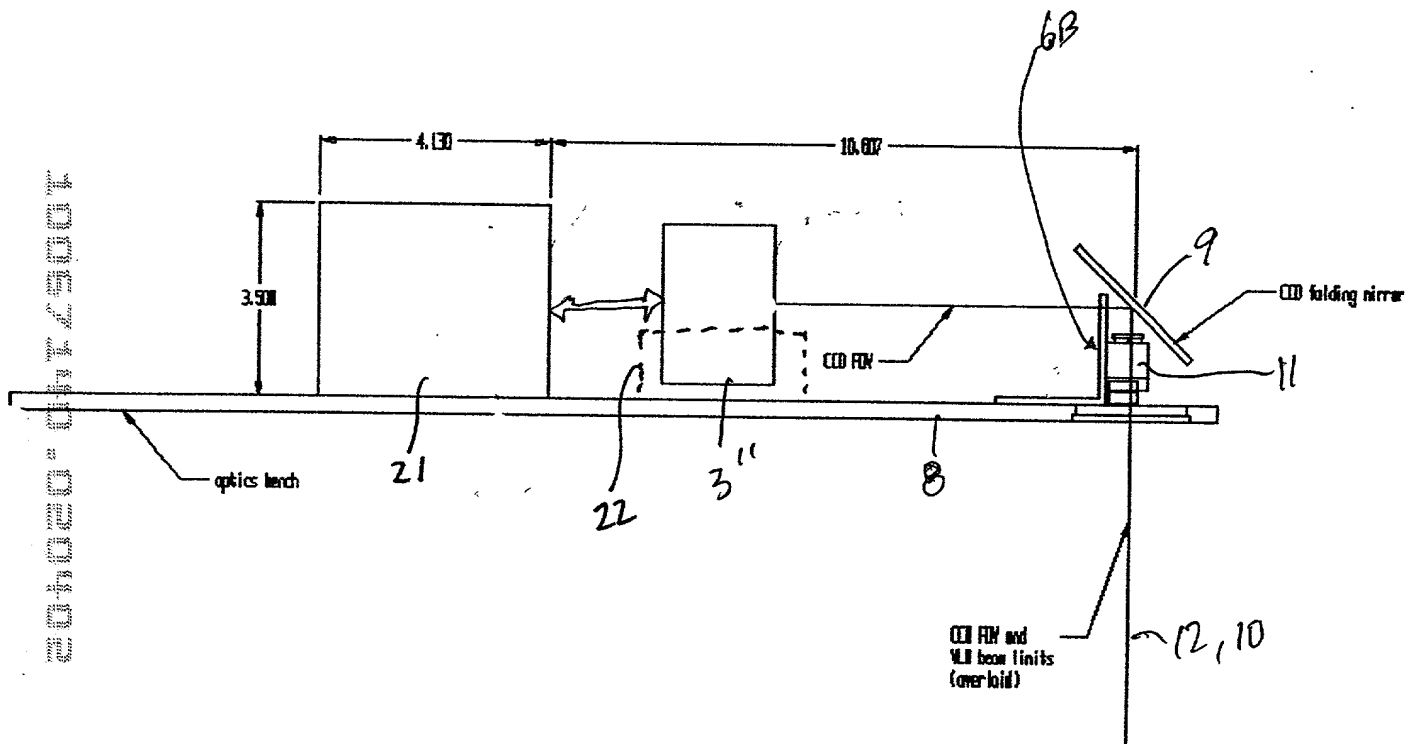


FIG. 3E7

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Variable FOV

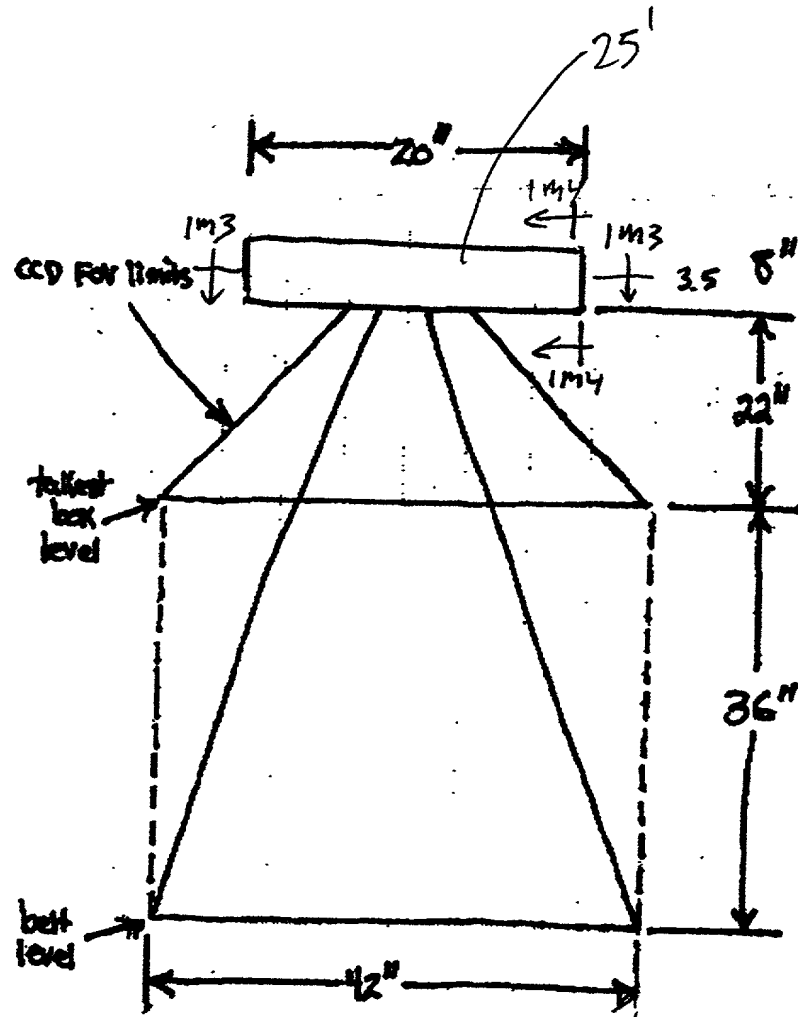


FIG. 3E8

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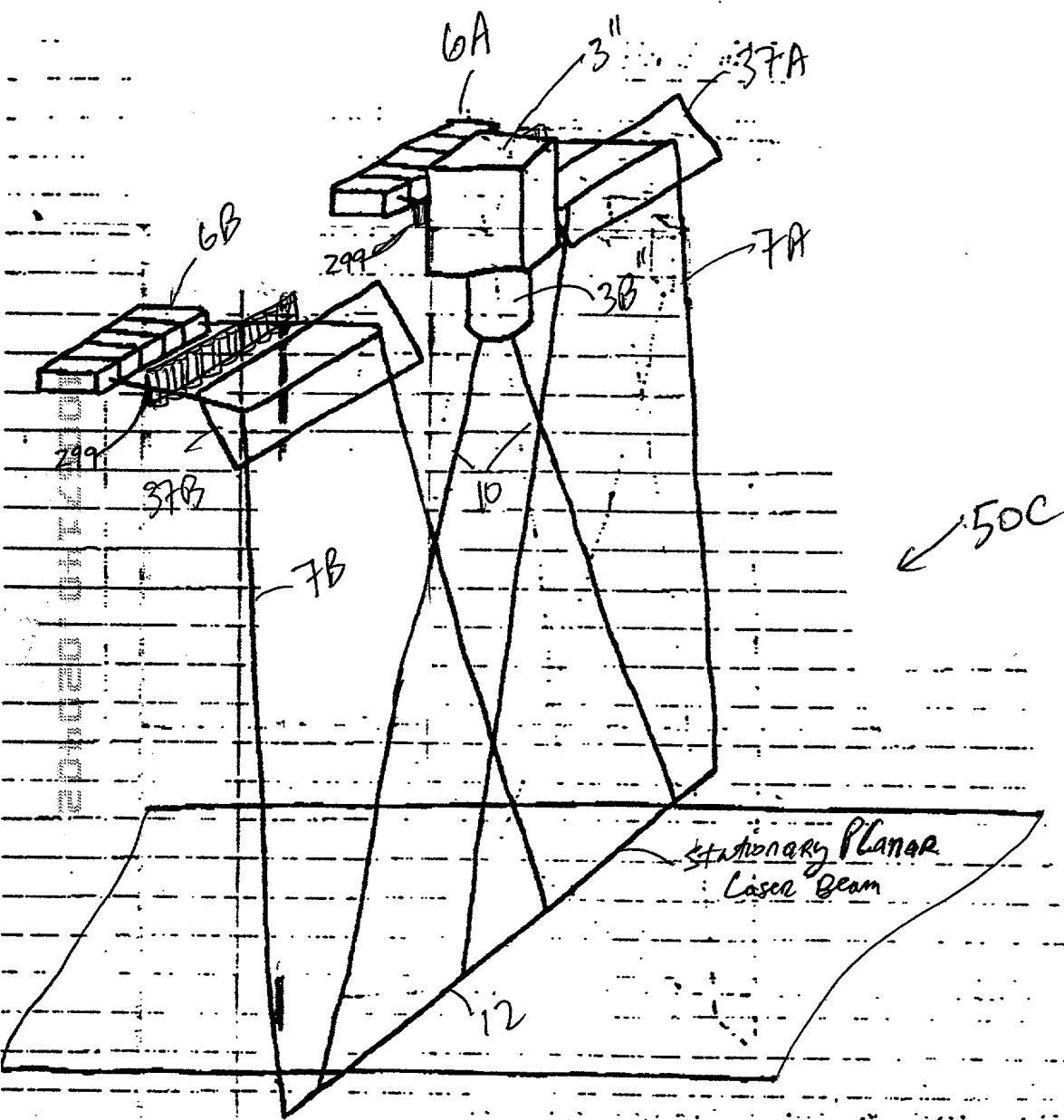


FIG. 3F1

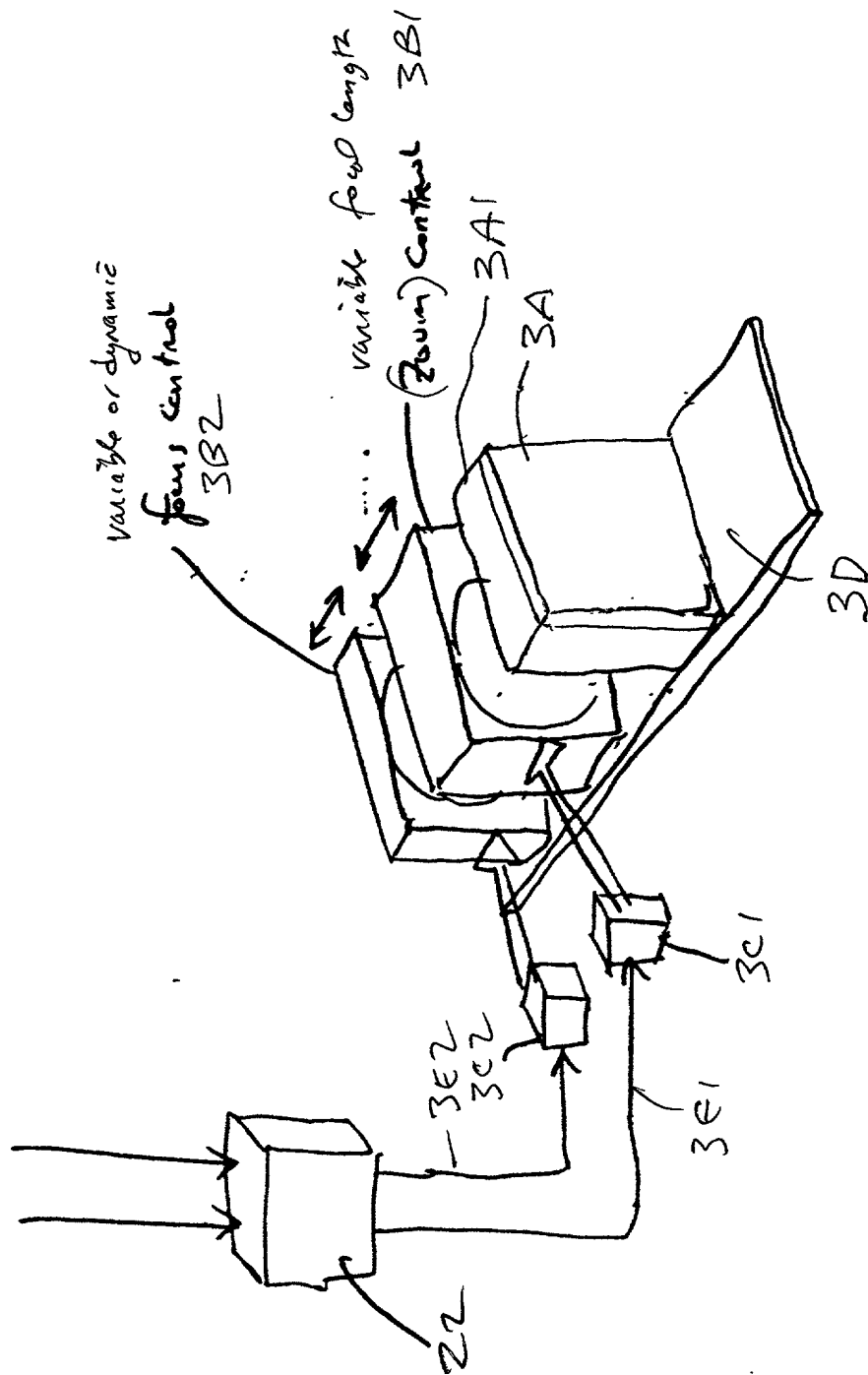


FIG. 3F3

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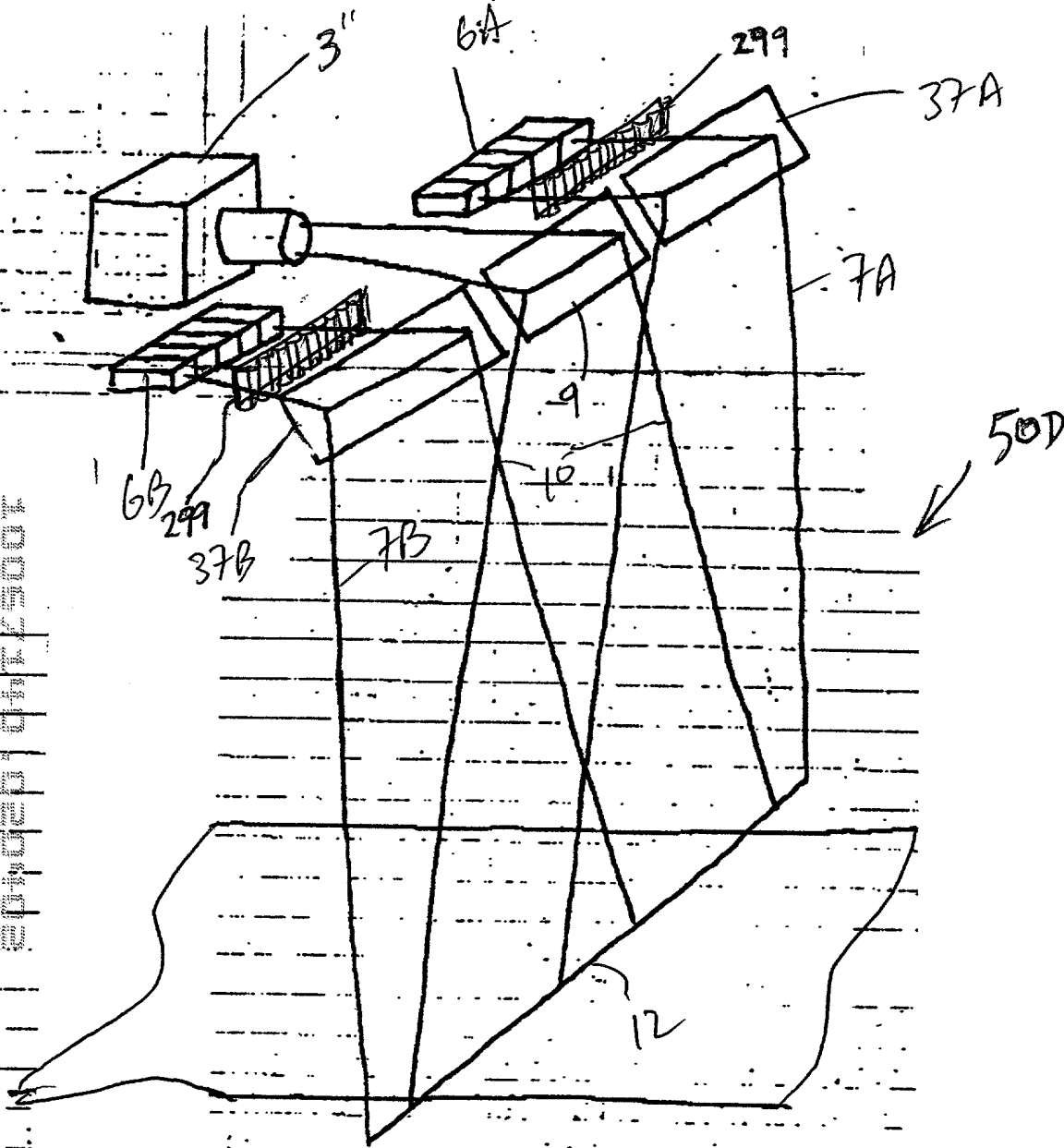


FIG. 3G1

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FIG. 392

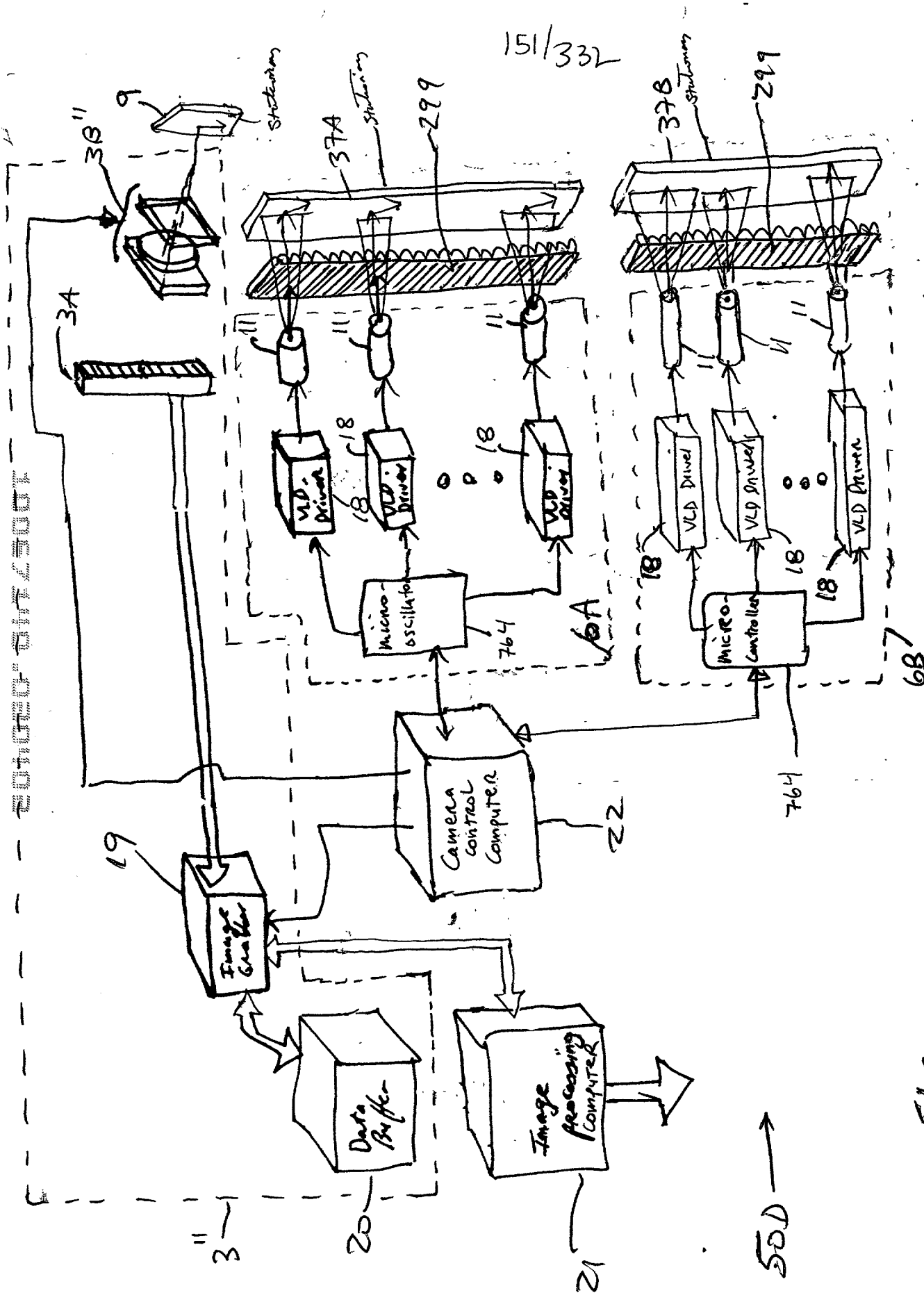


FIG. 392

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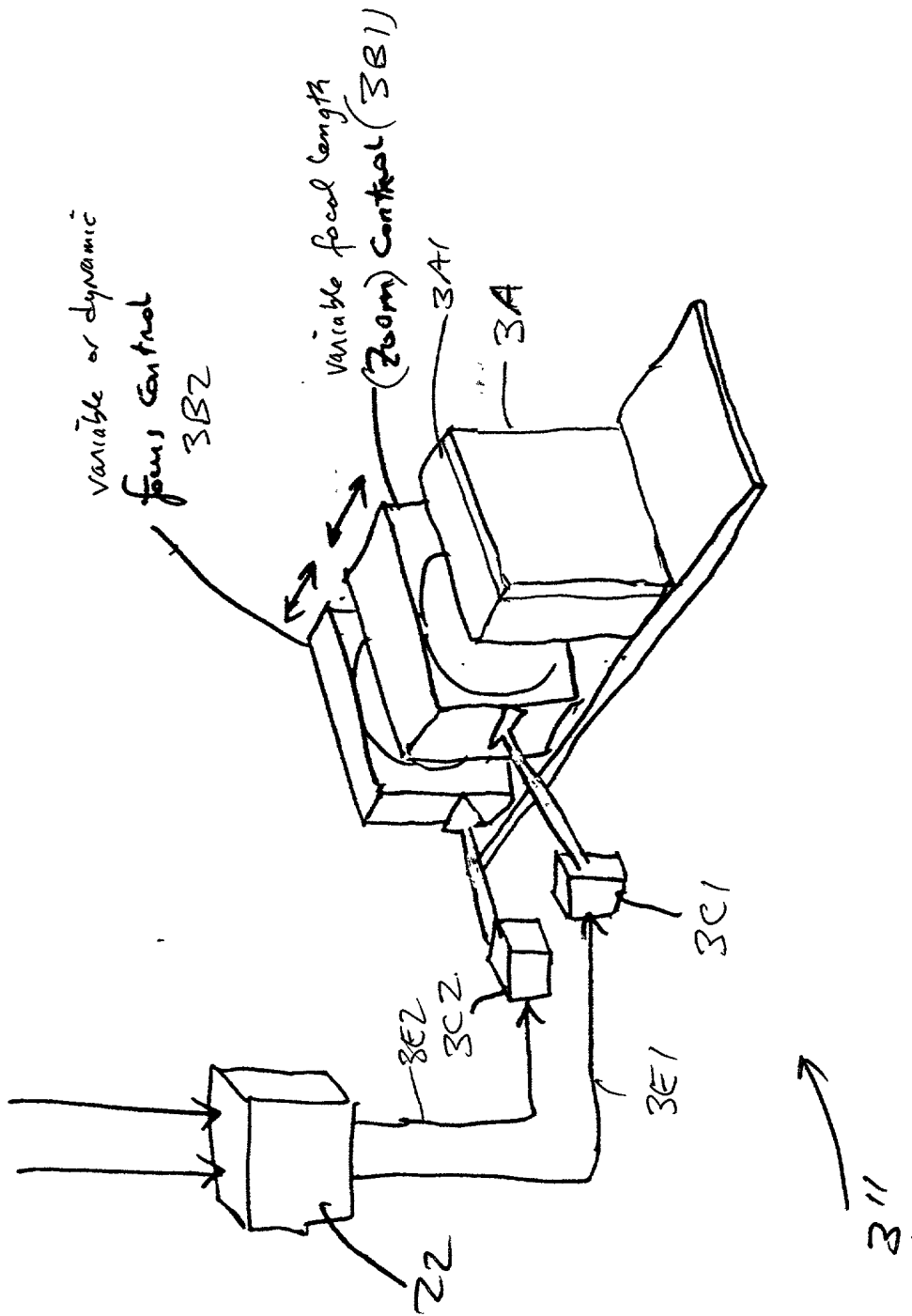


FIG. 3G3

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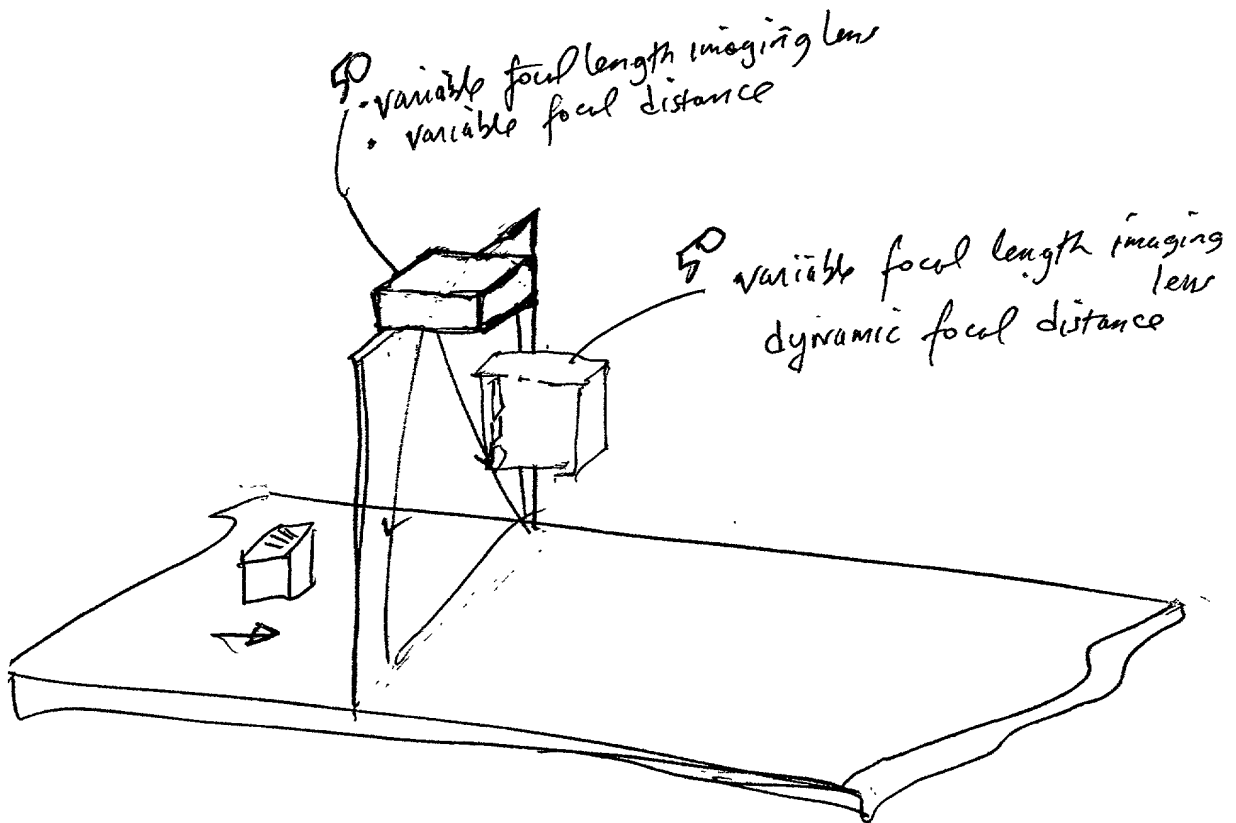


FIG. 3H

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Composite
Plane of
Laser
Illumination

12

FOV Limits
(10)

50D

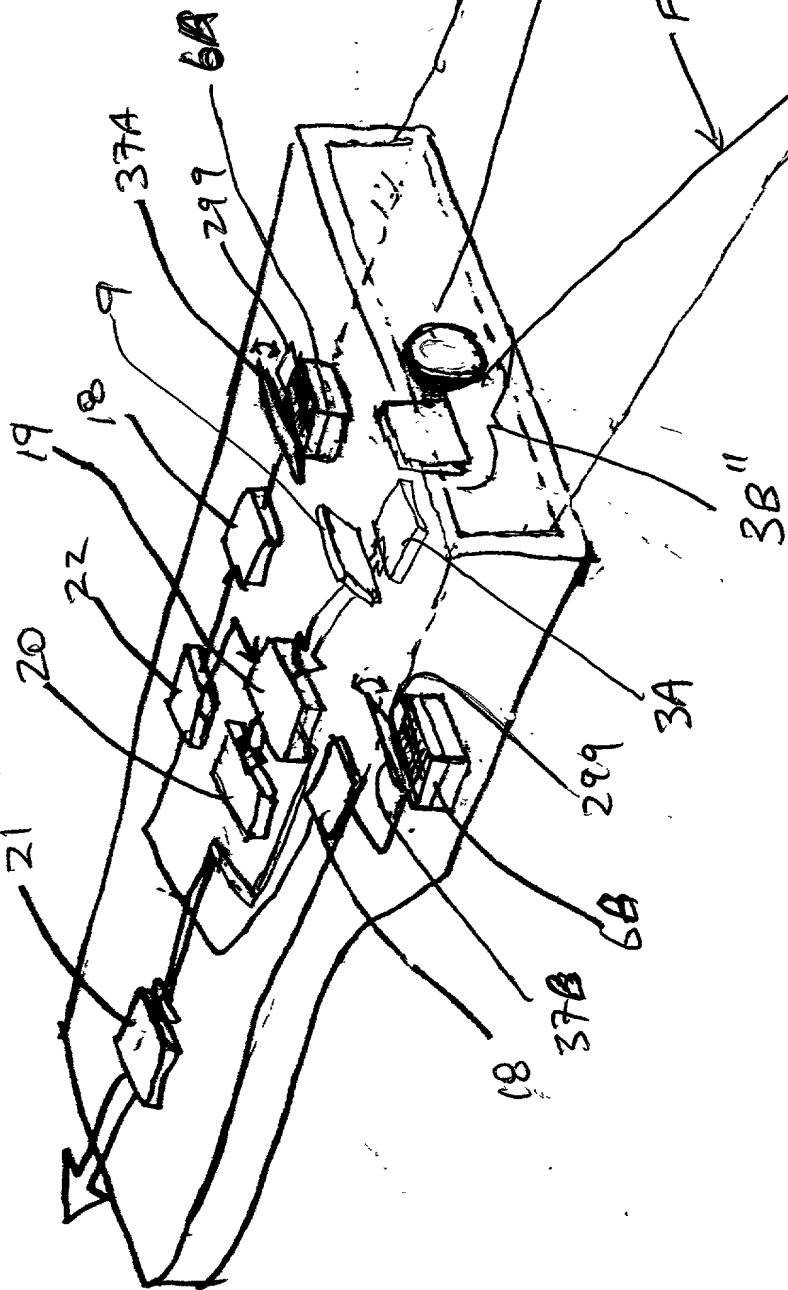


FIG. 3I

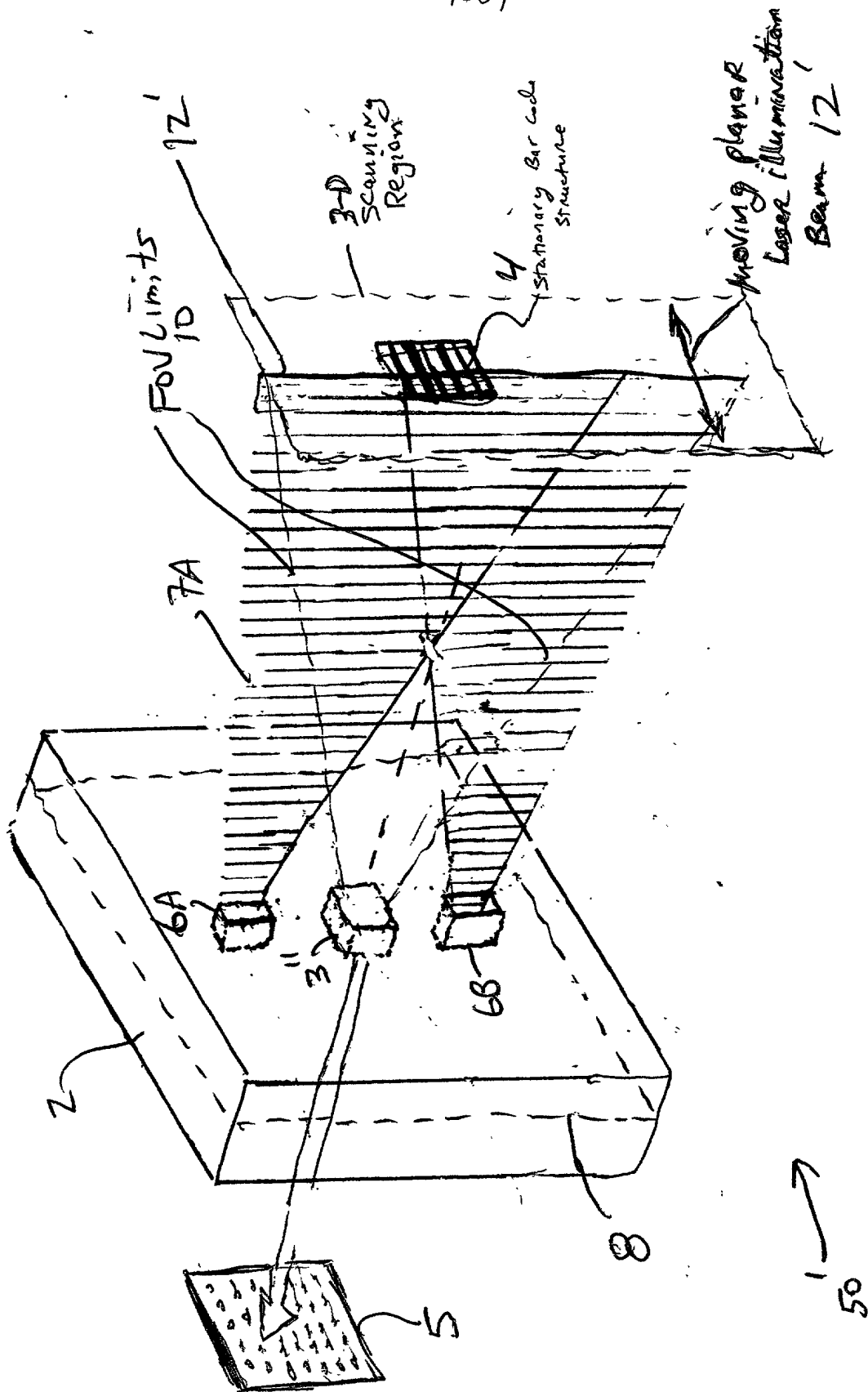


FIG. 3J1

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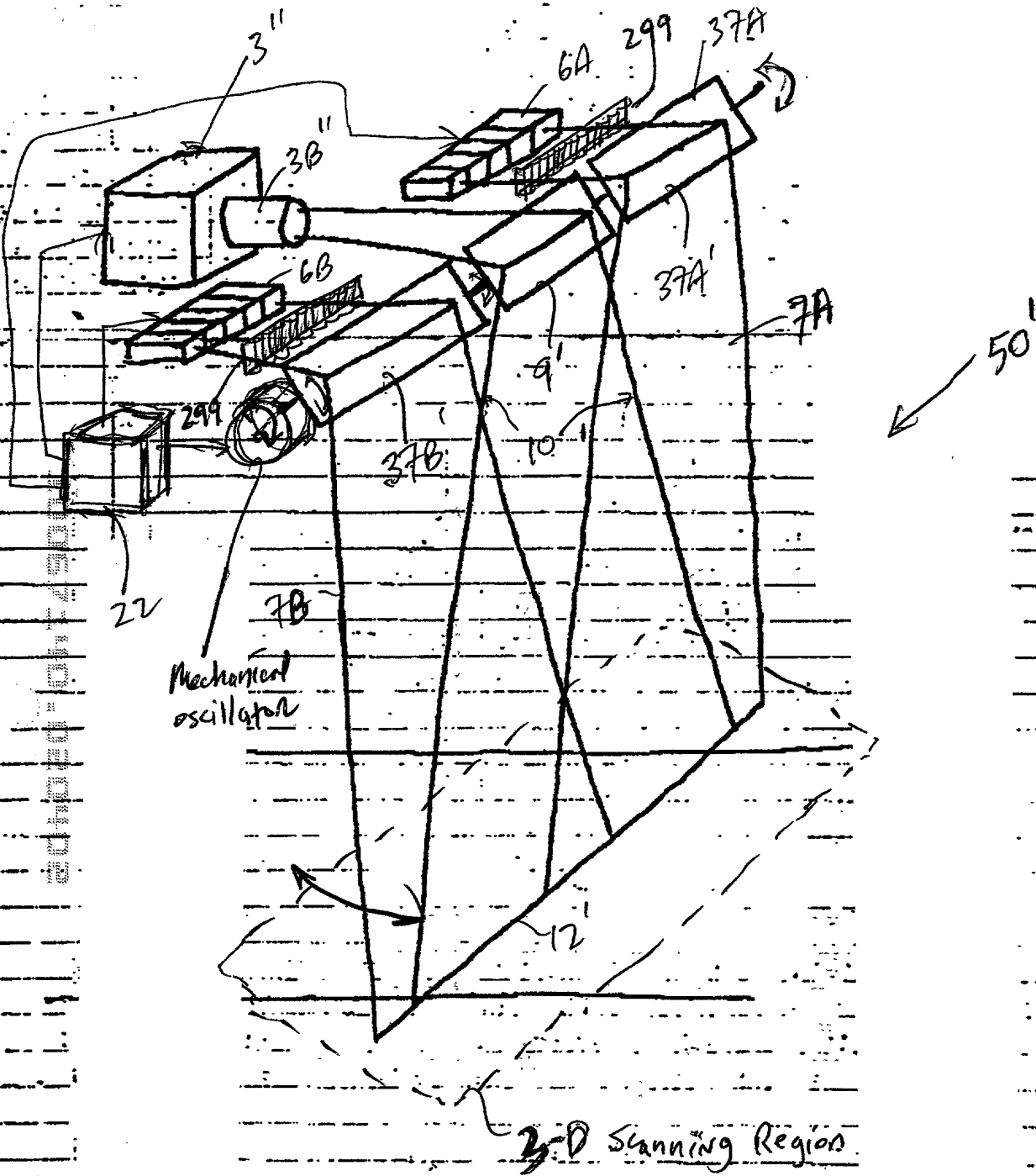


FIG 3J2

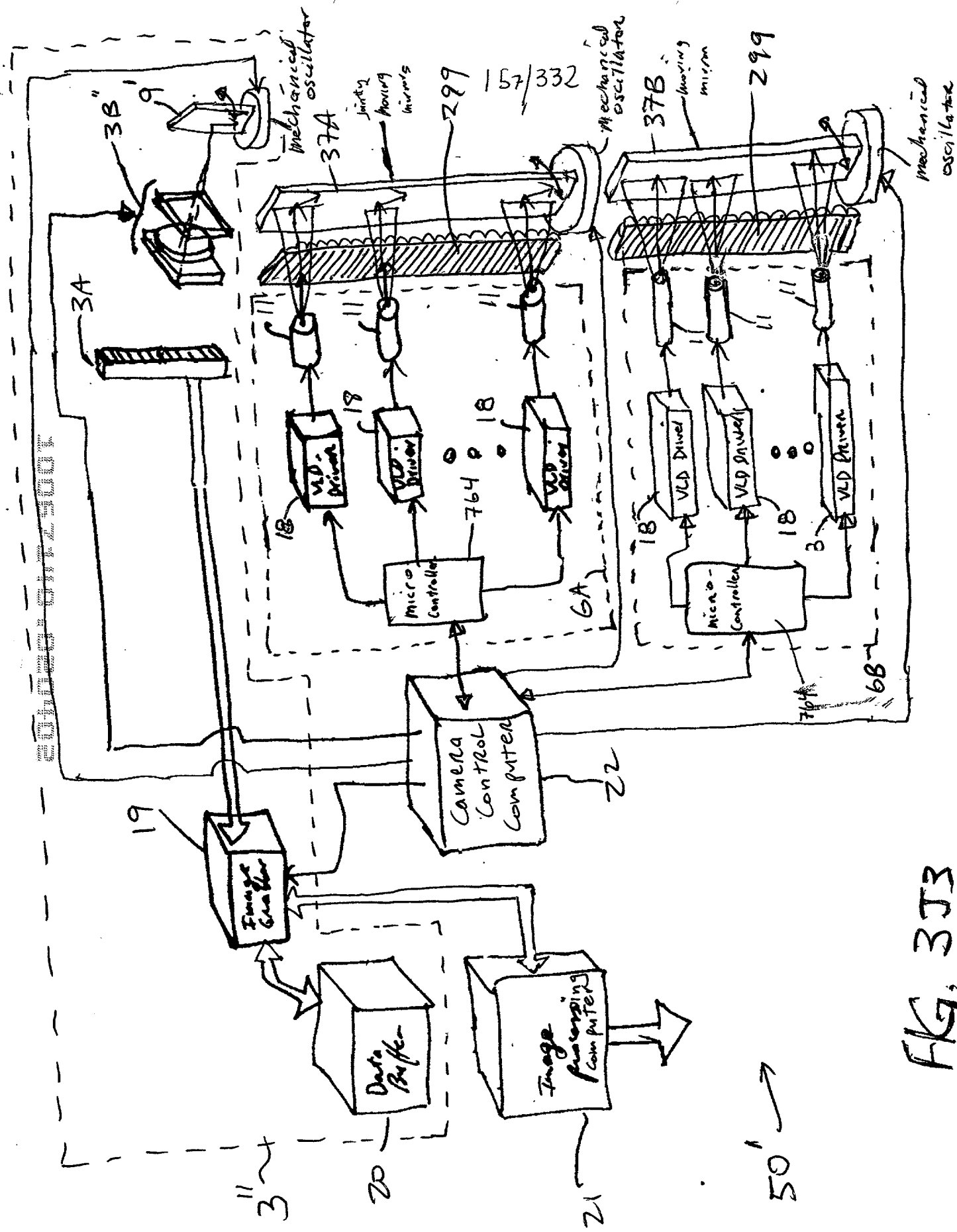


FIG. 3J3

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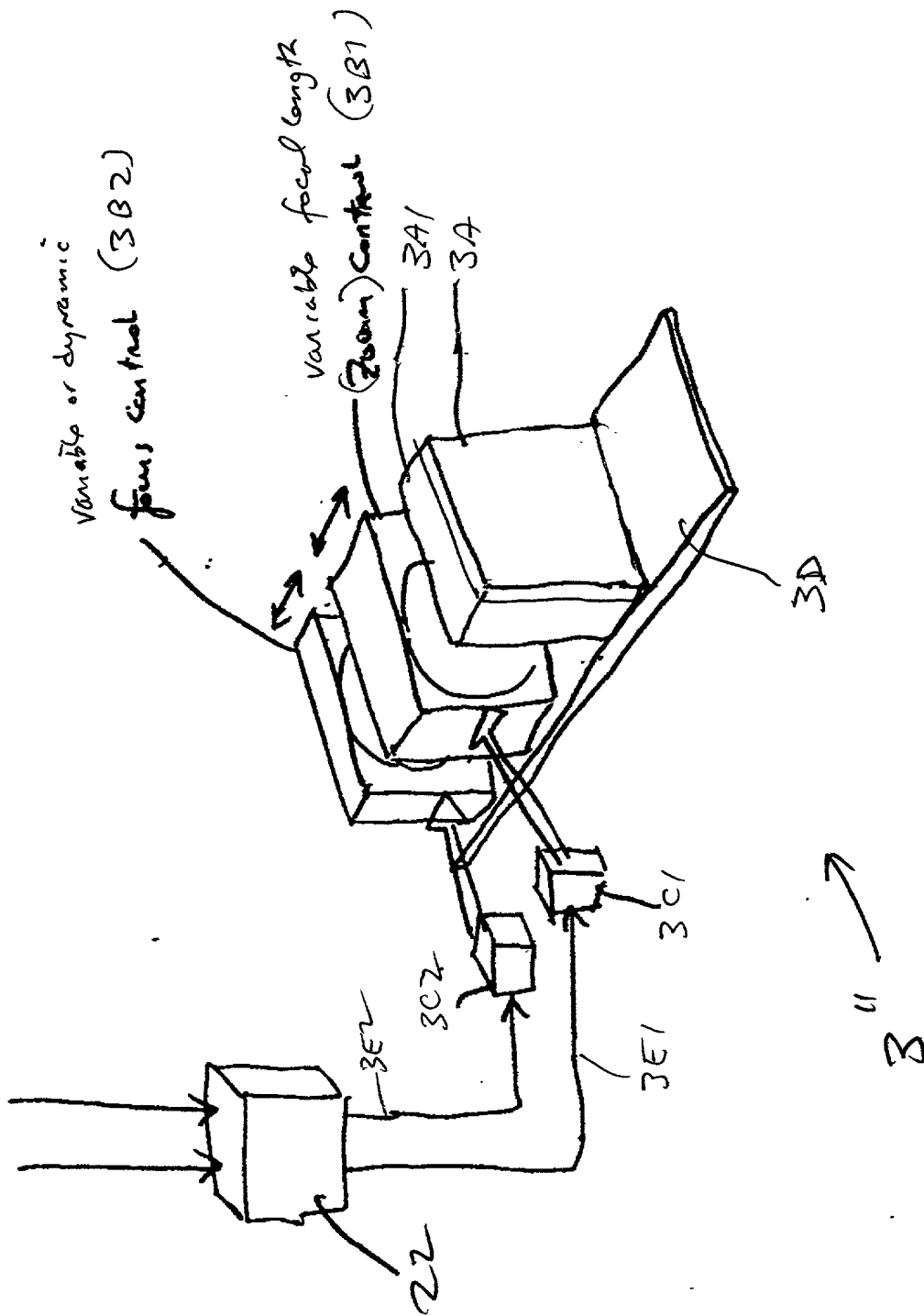


FIG. 3J4

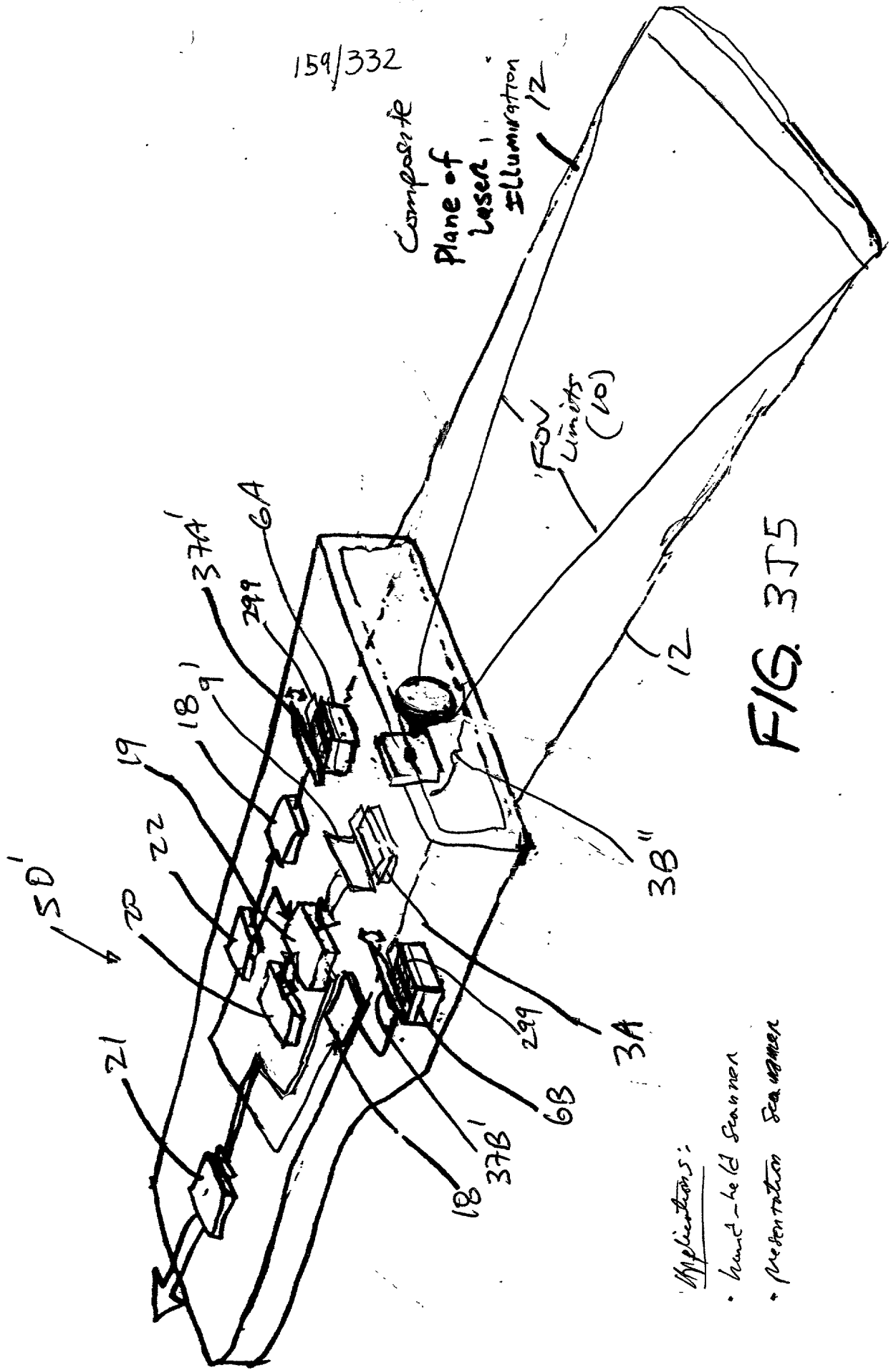


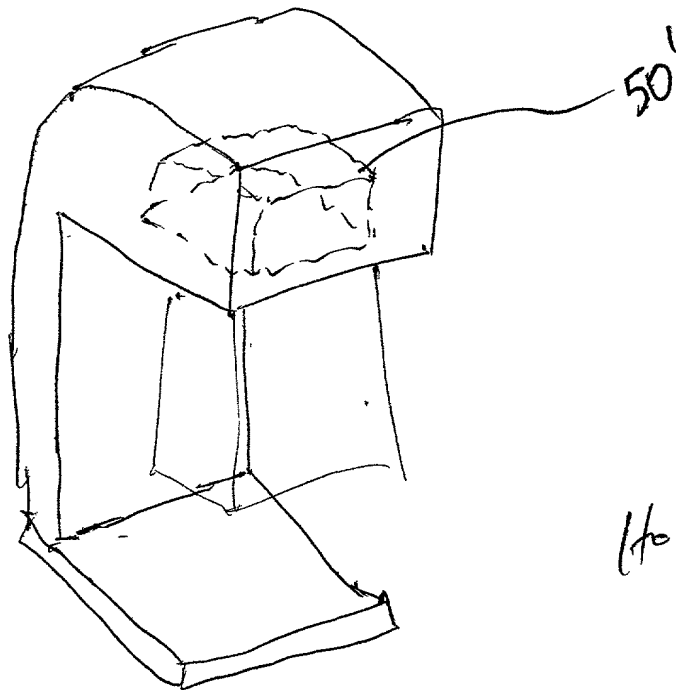
FIG. 3J5

Applications:

- hand-held scanner
- perimeter scanner

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100440000



2-D
hold-under
scanner

FIG. 3J6

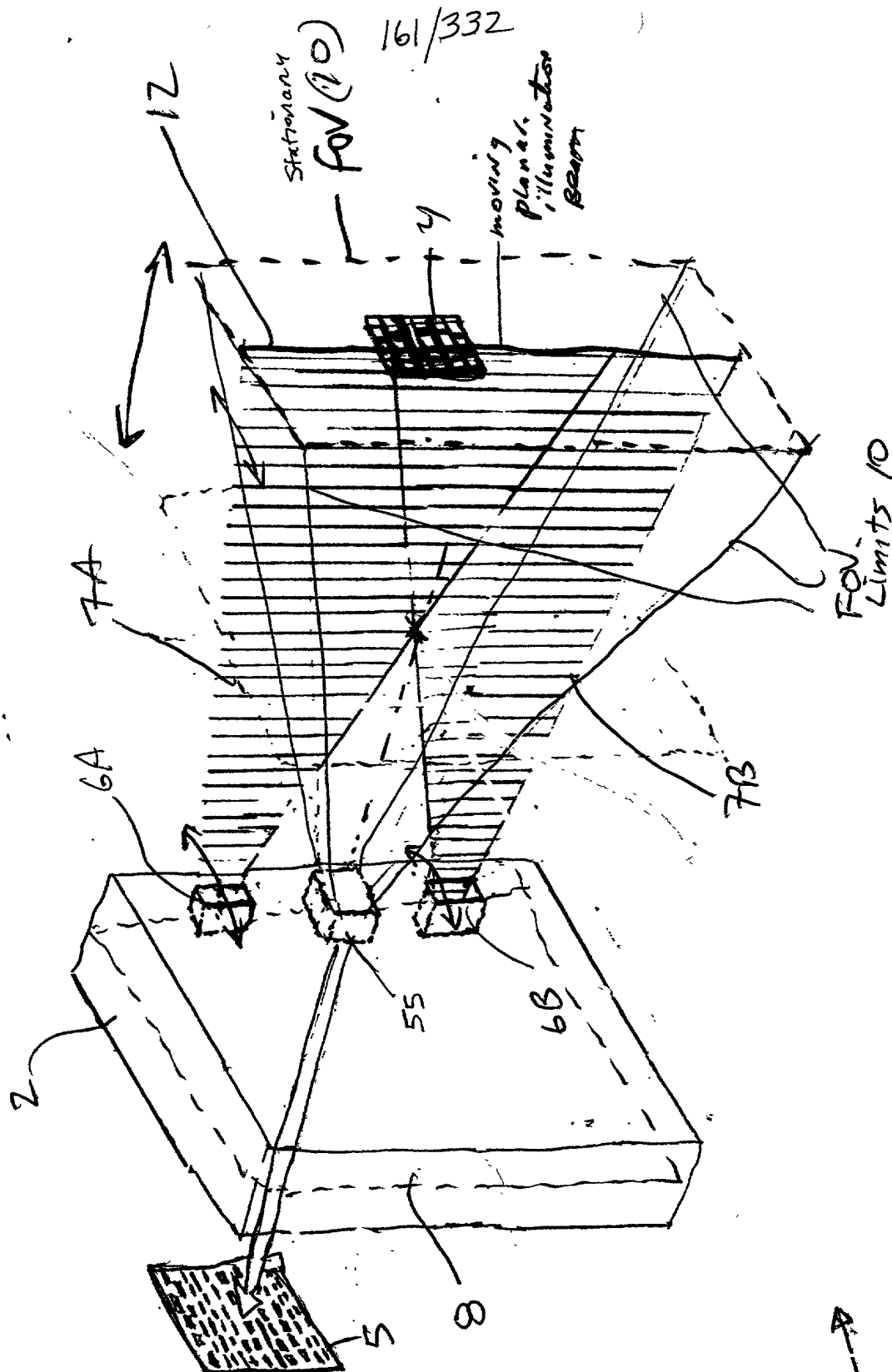


FIG 4A

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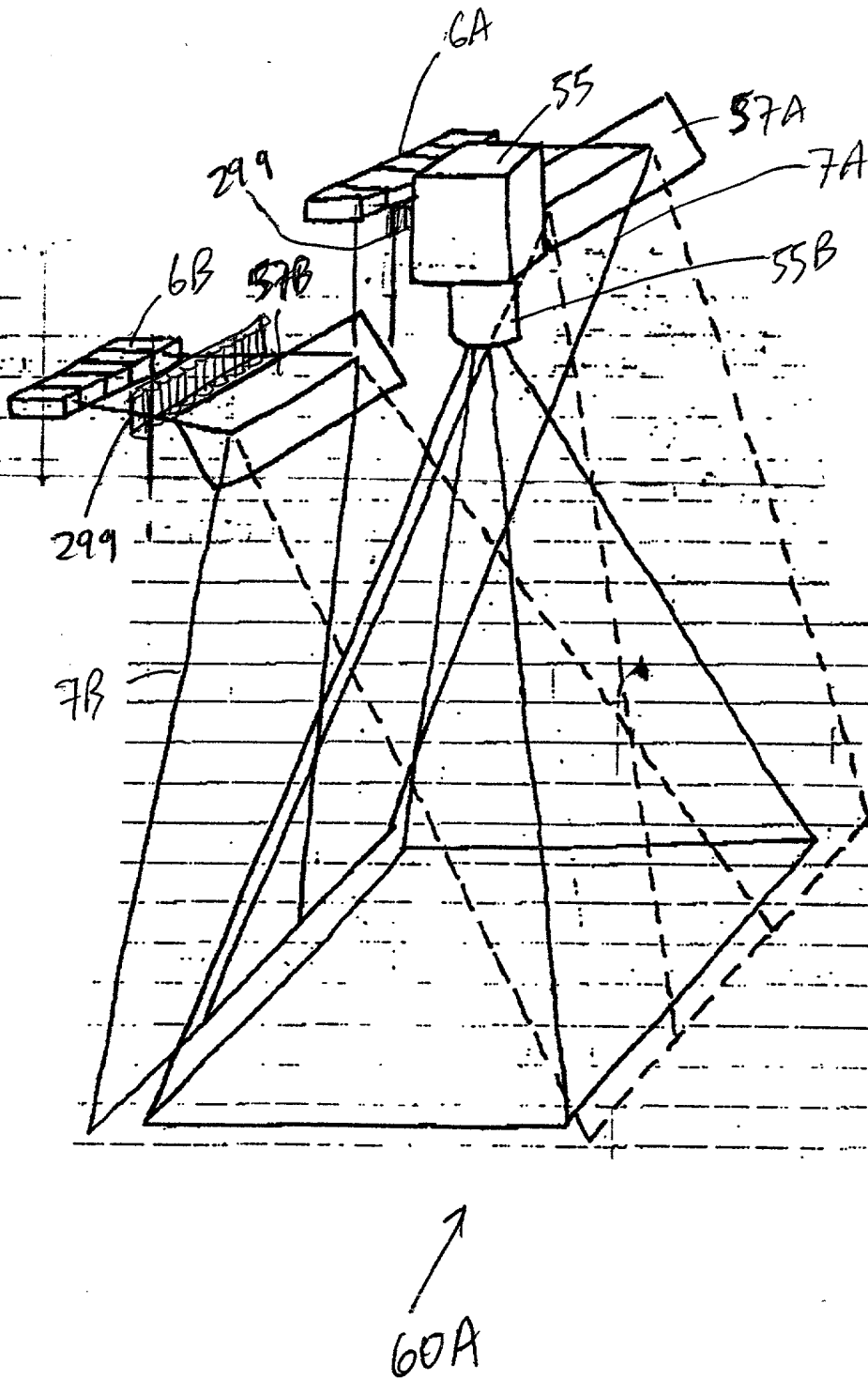


FIG. 4B1

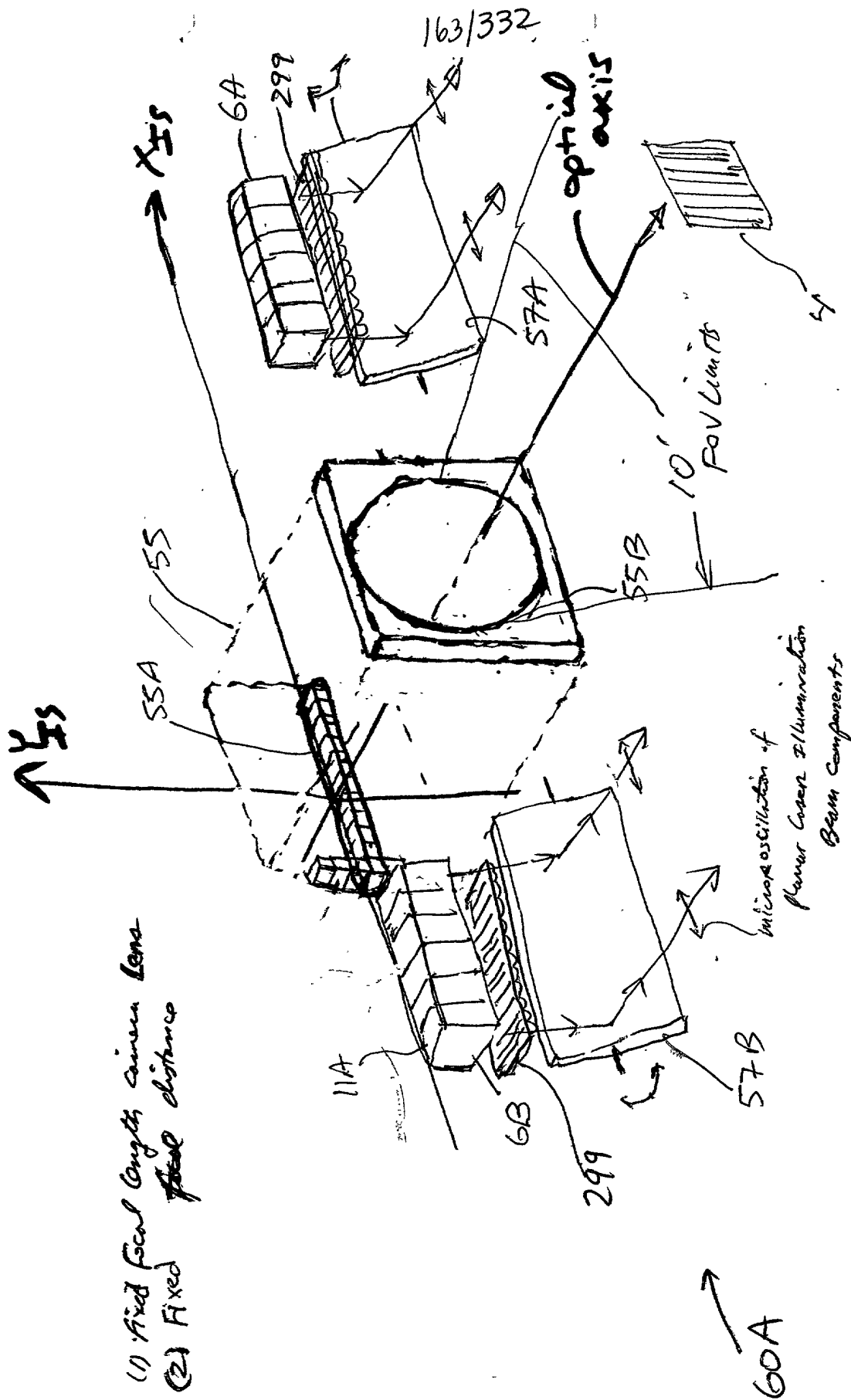


FIG. 4BZ

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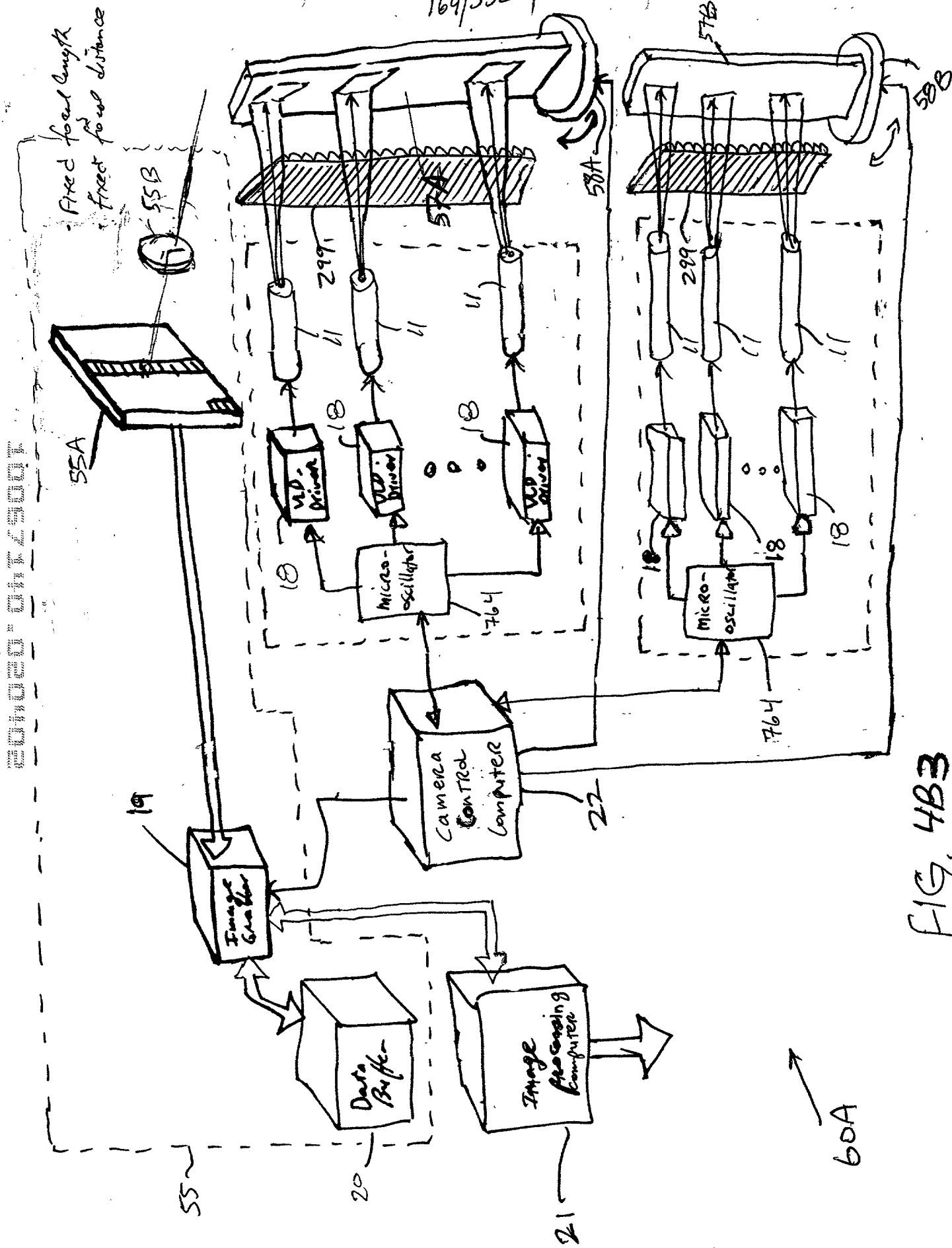


FIG. 4B3

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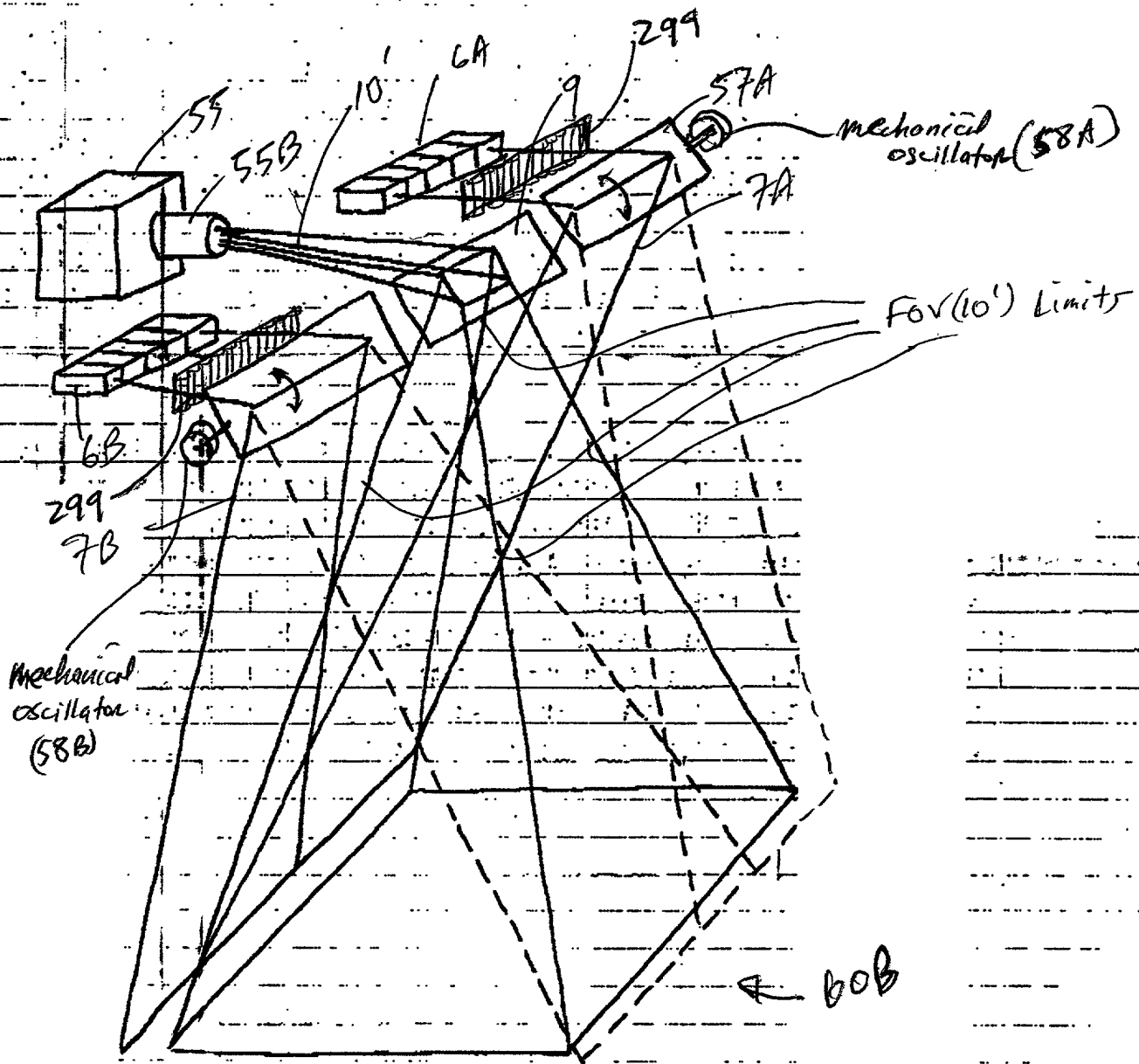


FIG. 4C1

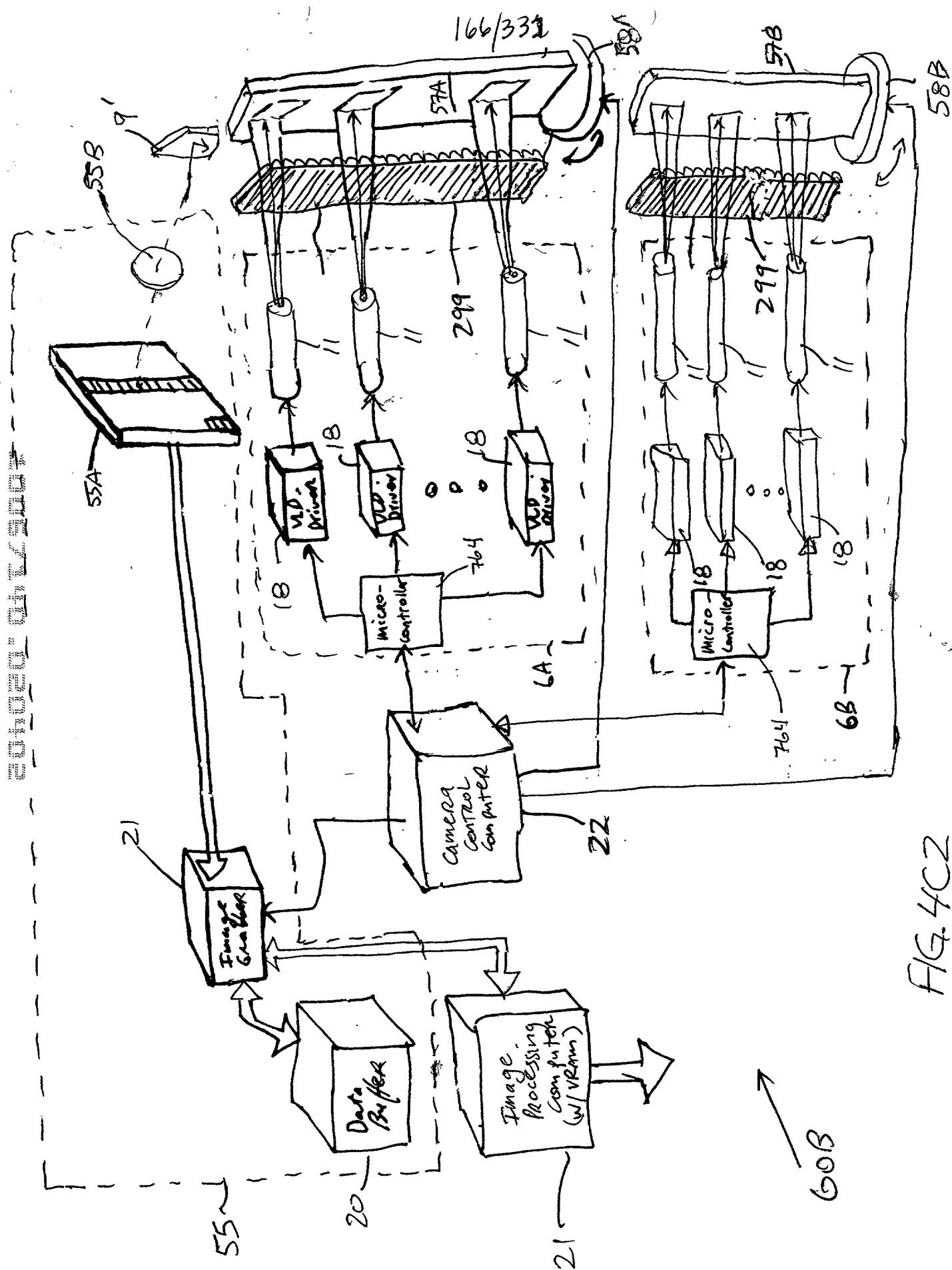


FIG. 4C2

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20140201 01:23:00

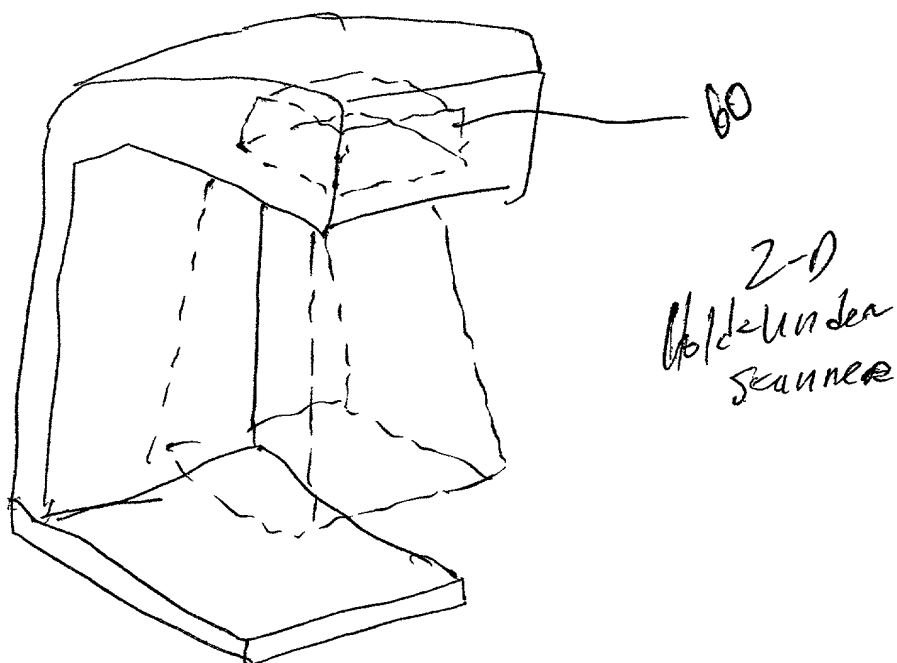


FIG. 4D

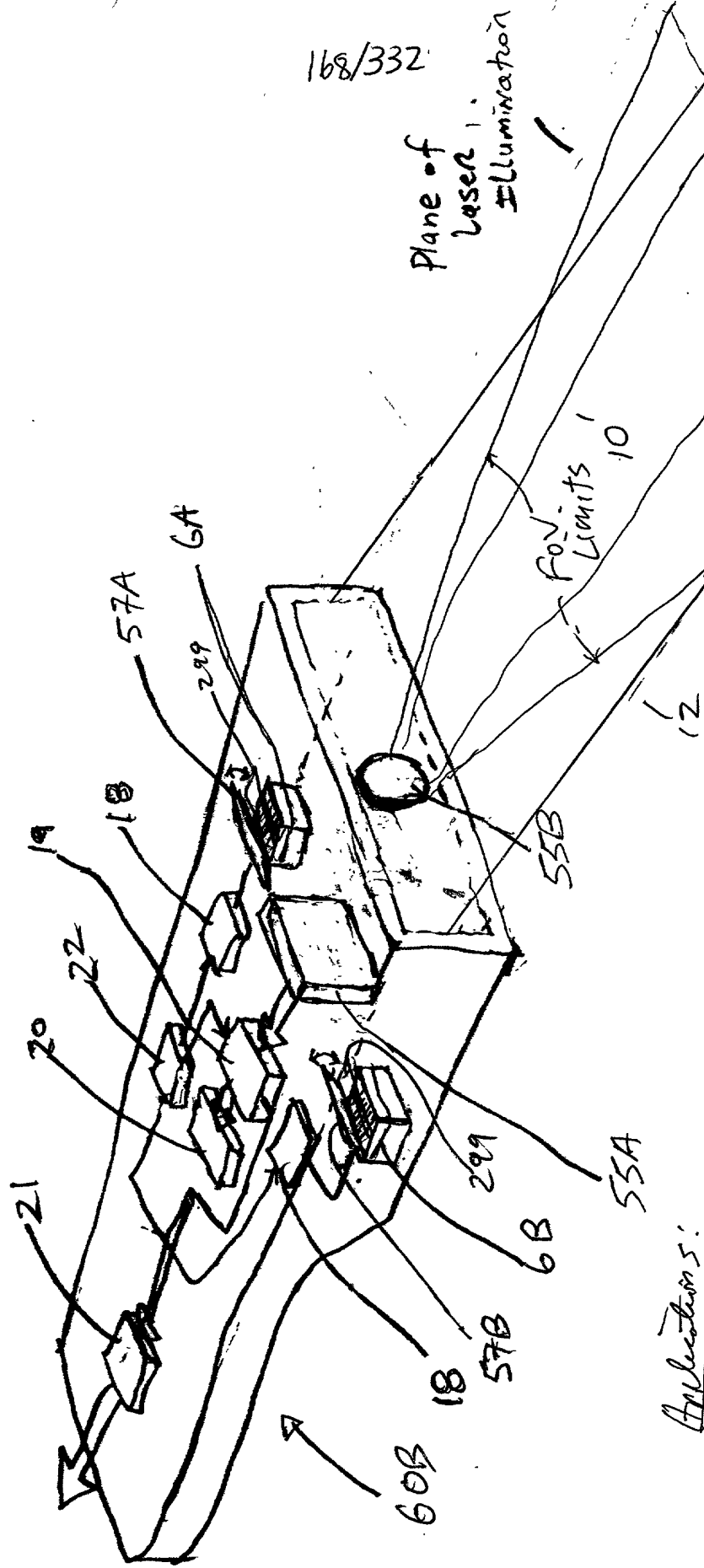


FIG. 4E

- Applications:
- Hand-held Scanner
 - Presentation Scanner

20140220 04:11:23001

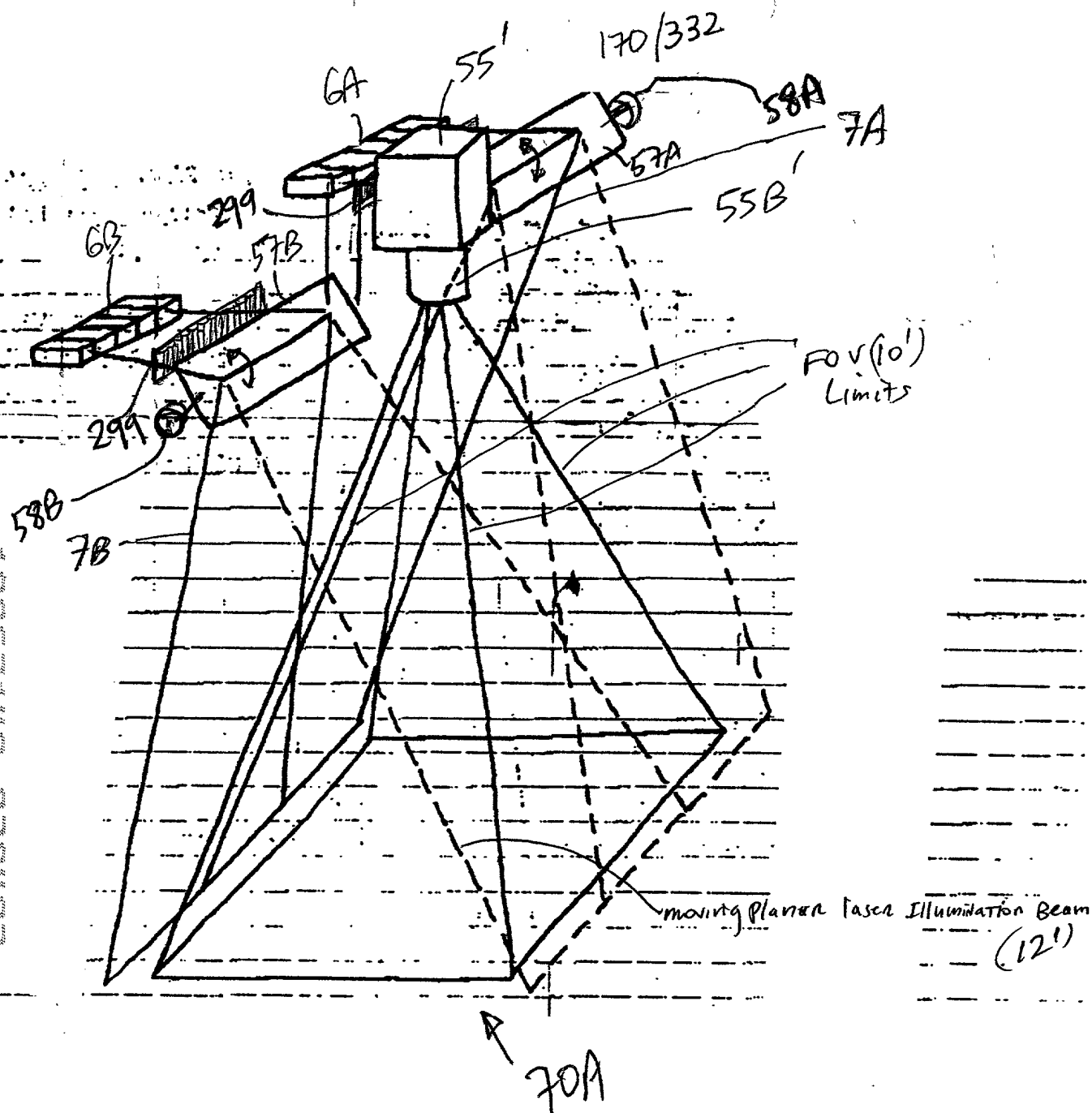


FIG 5B1

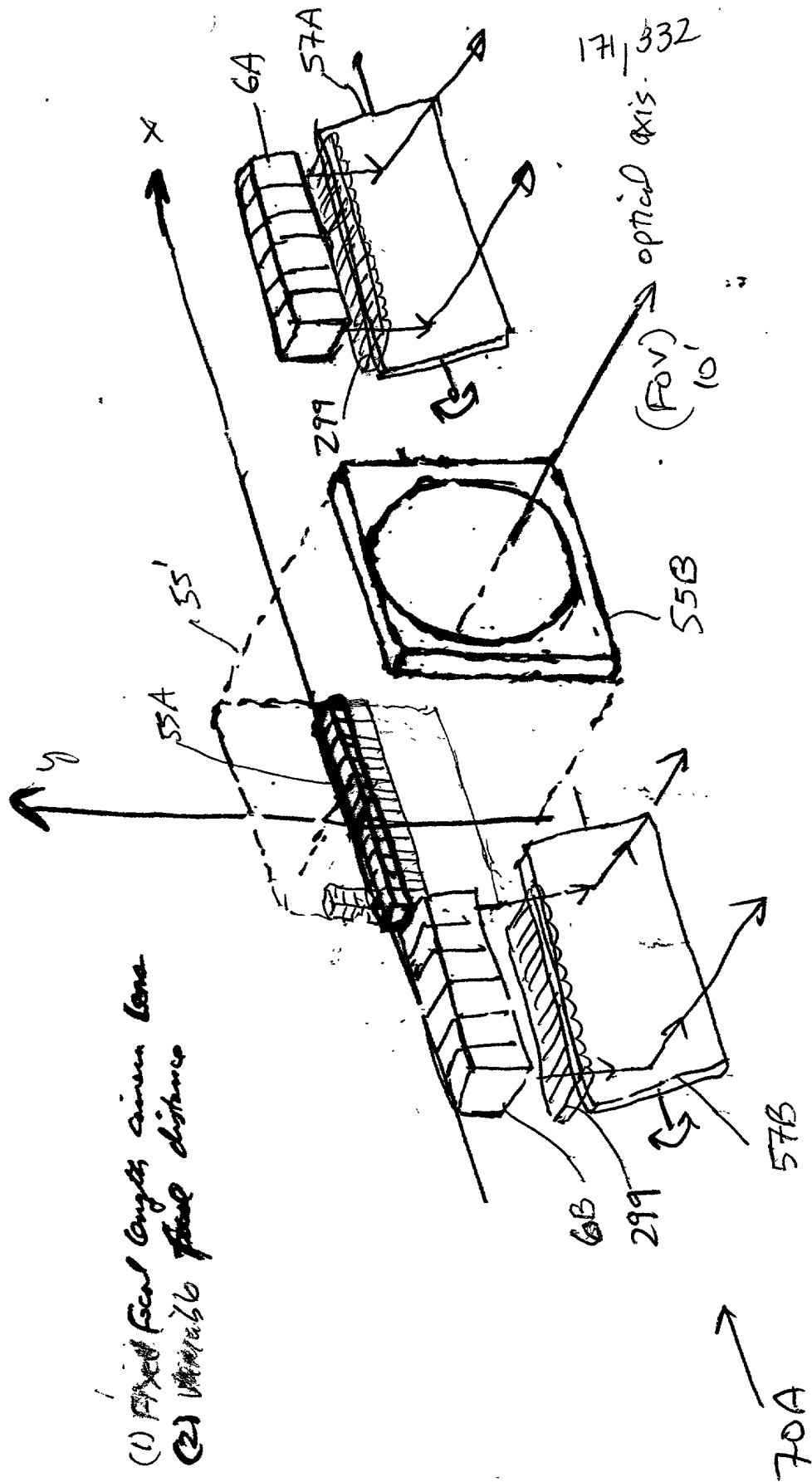
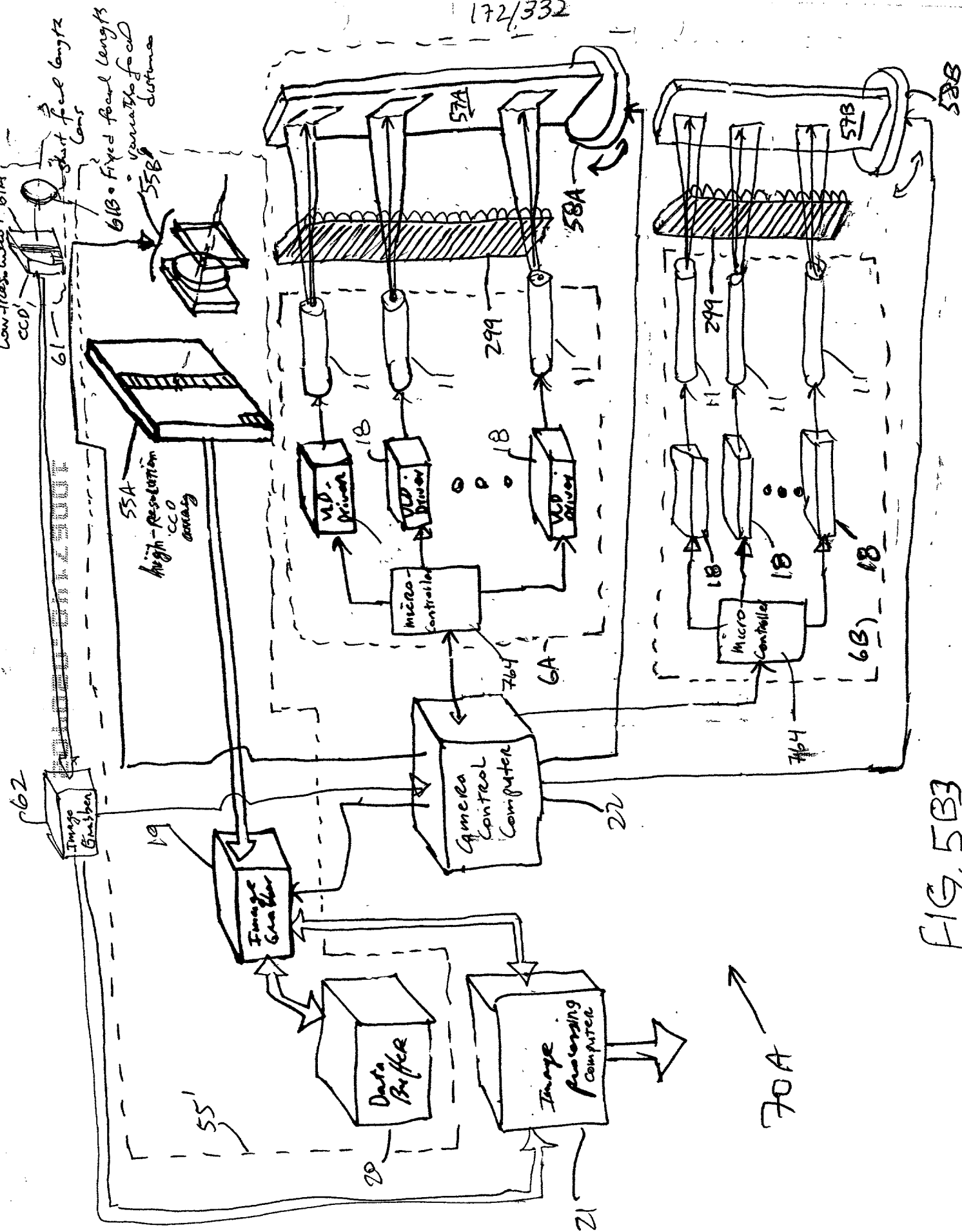


FIG. 5B2

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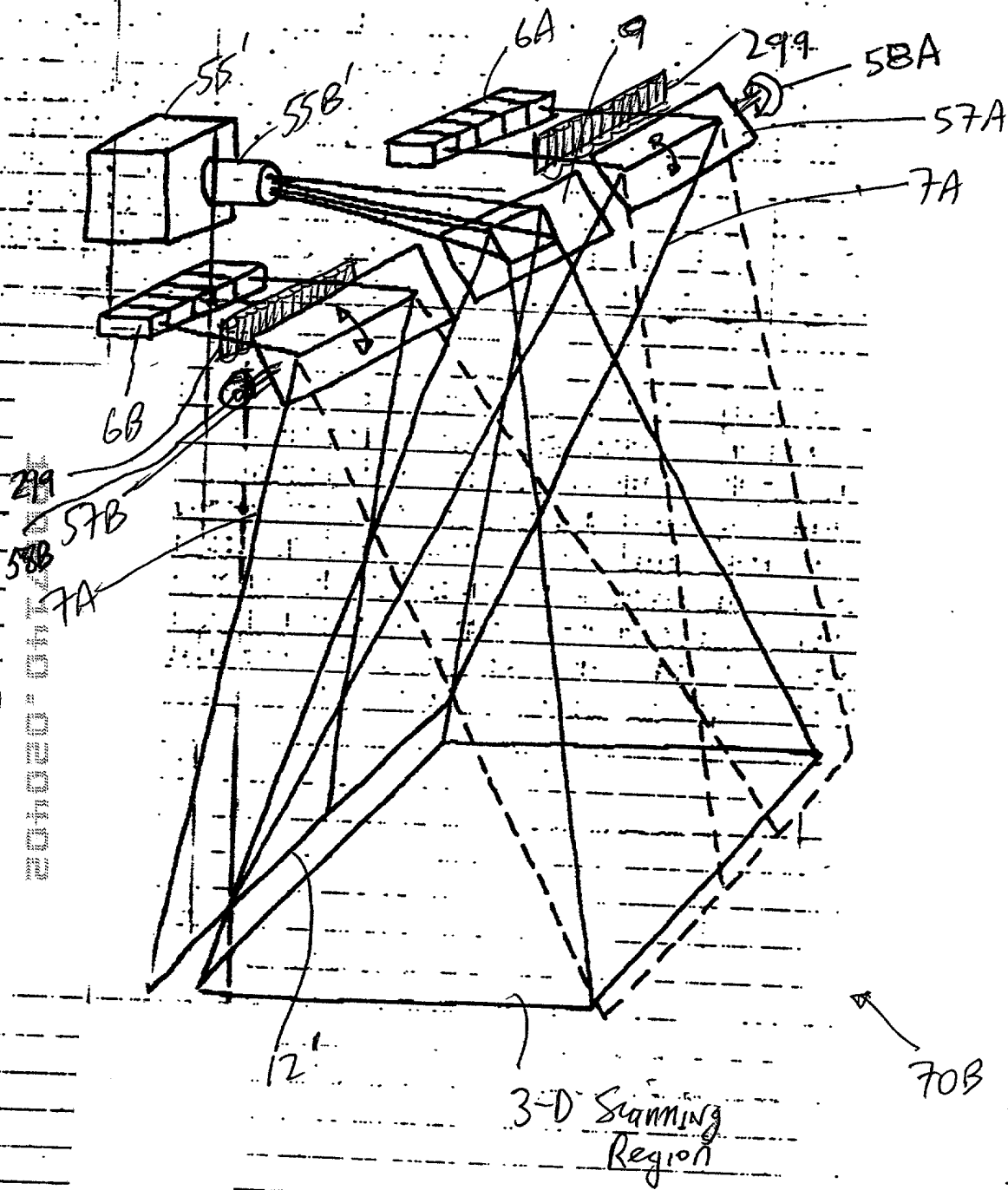


FIG. 5C1

[illegible]

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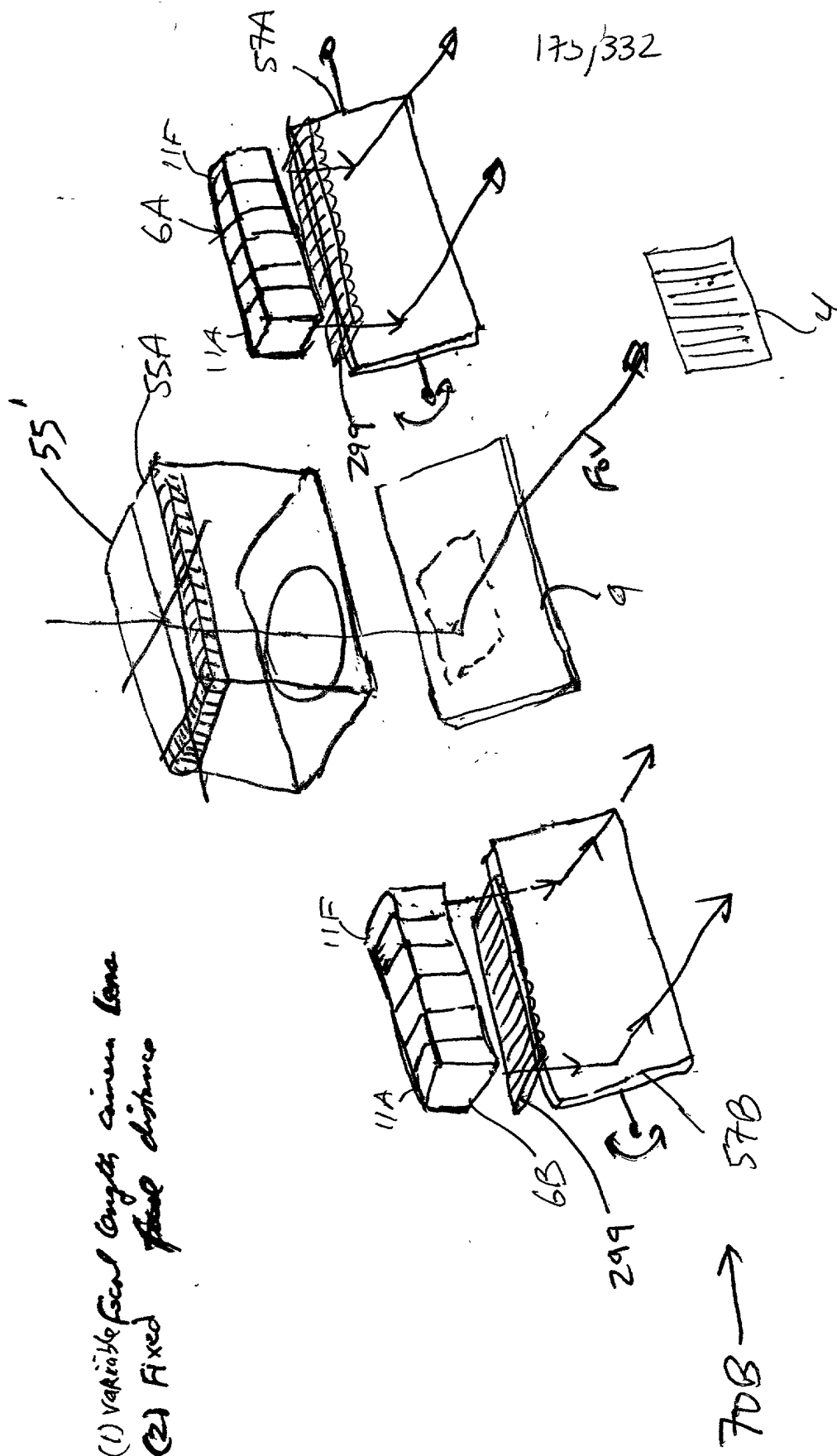


FIG. 5C

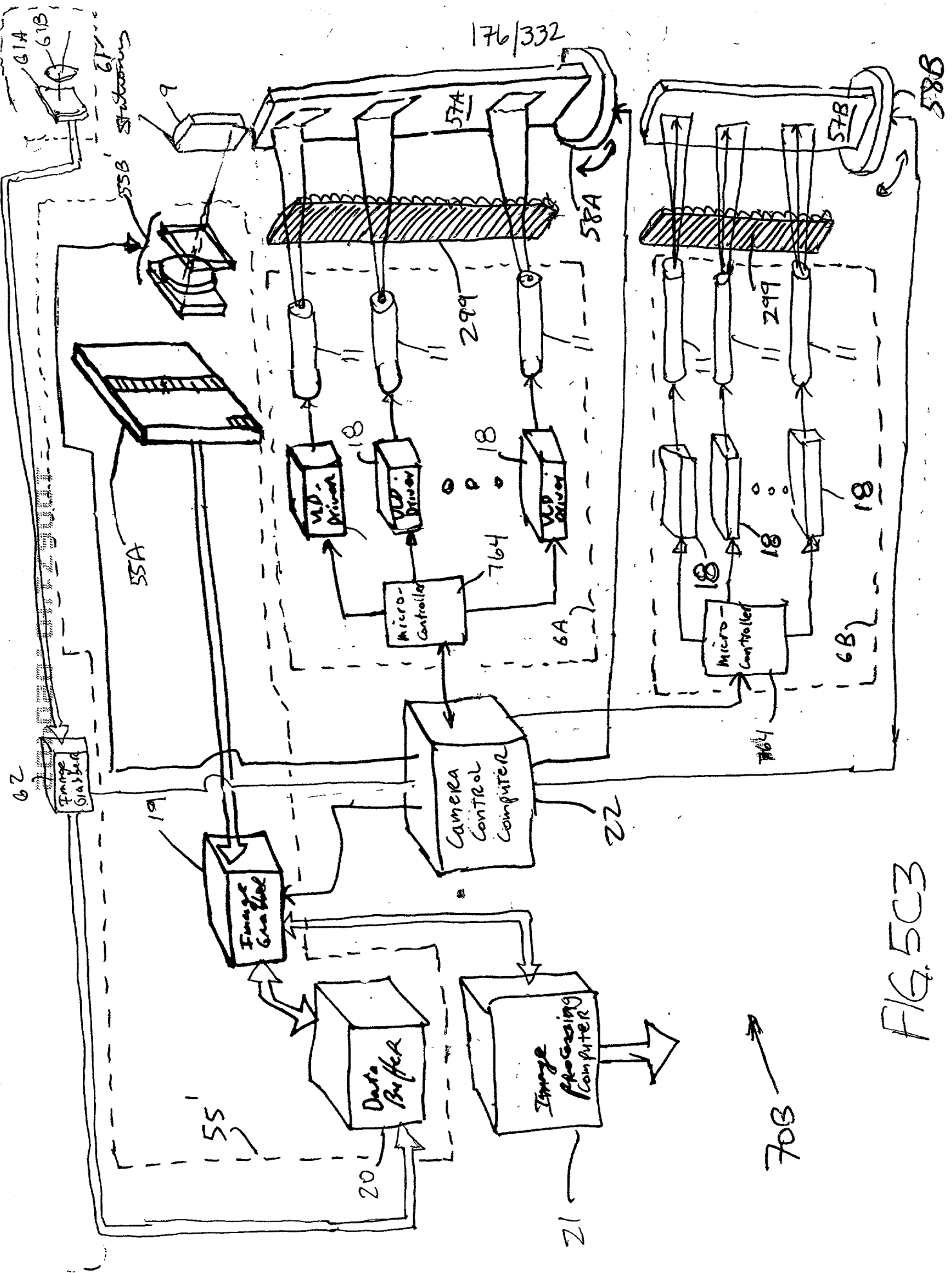


FIG. 5C3

10067140.20402

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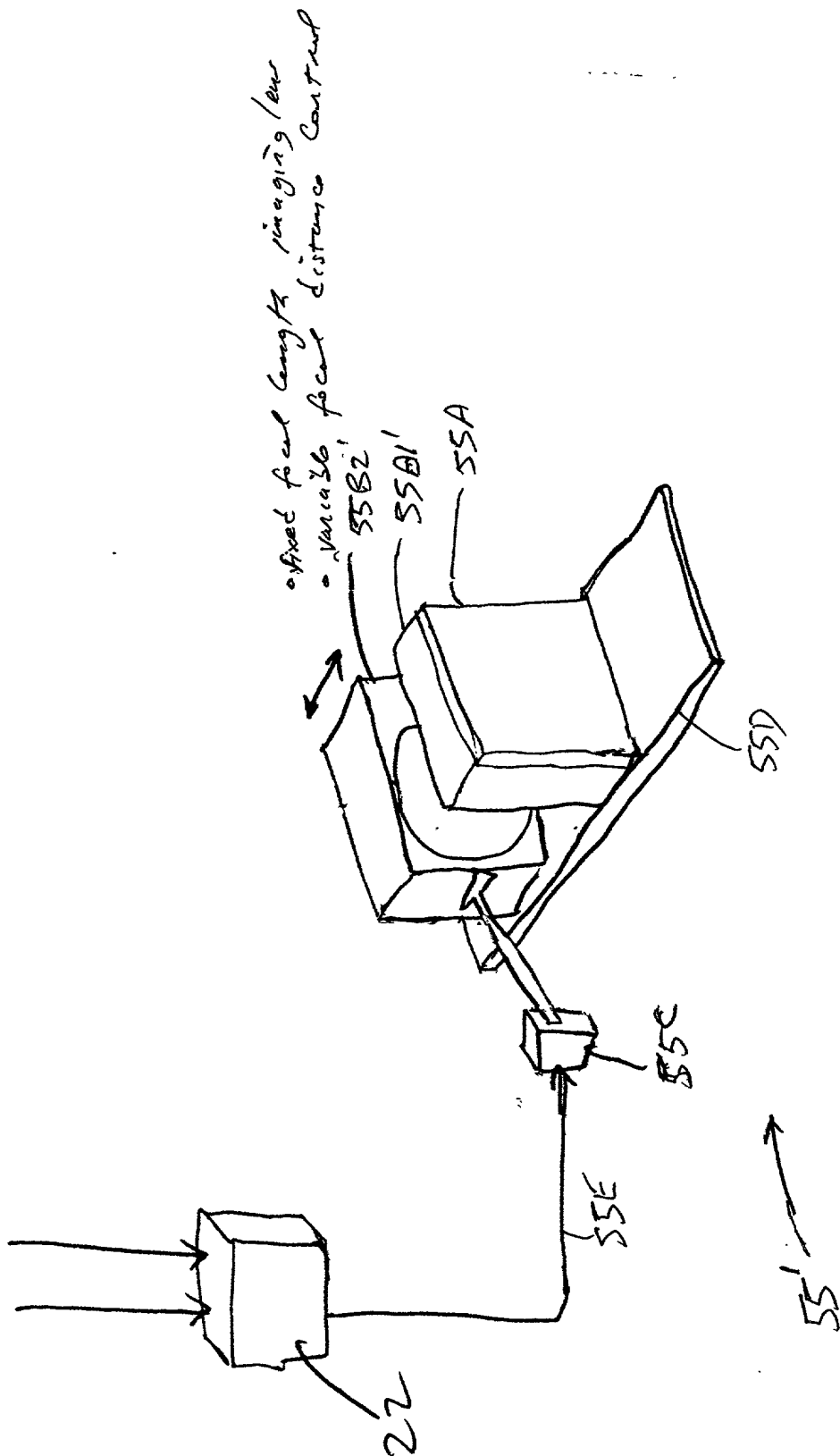


FIG. 5C4

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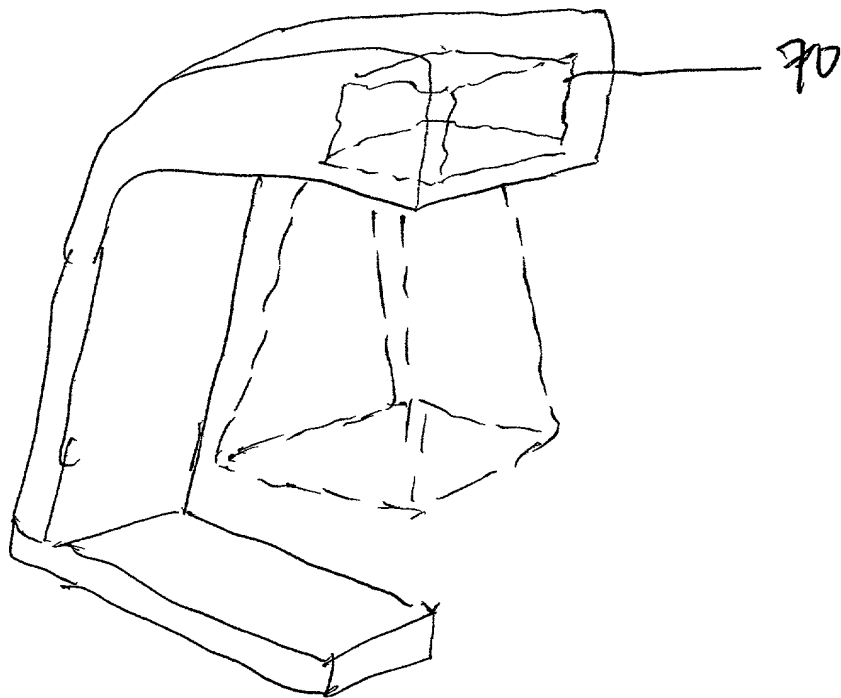


FIG 5D

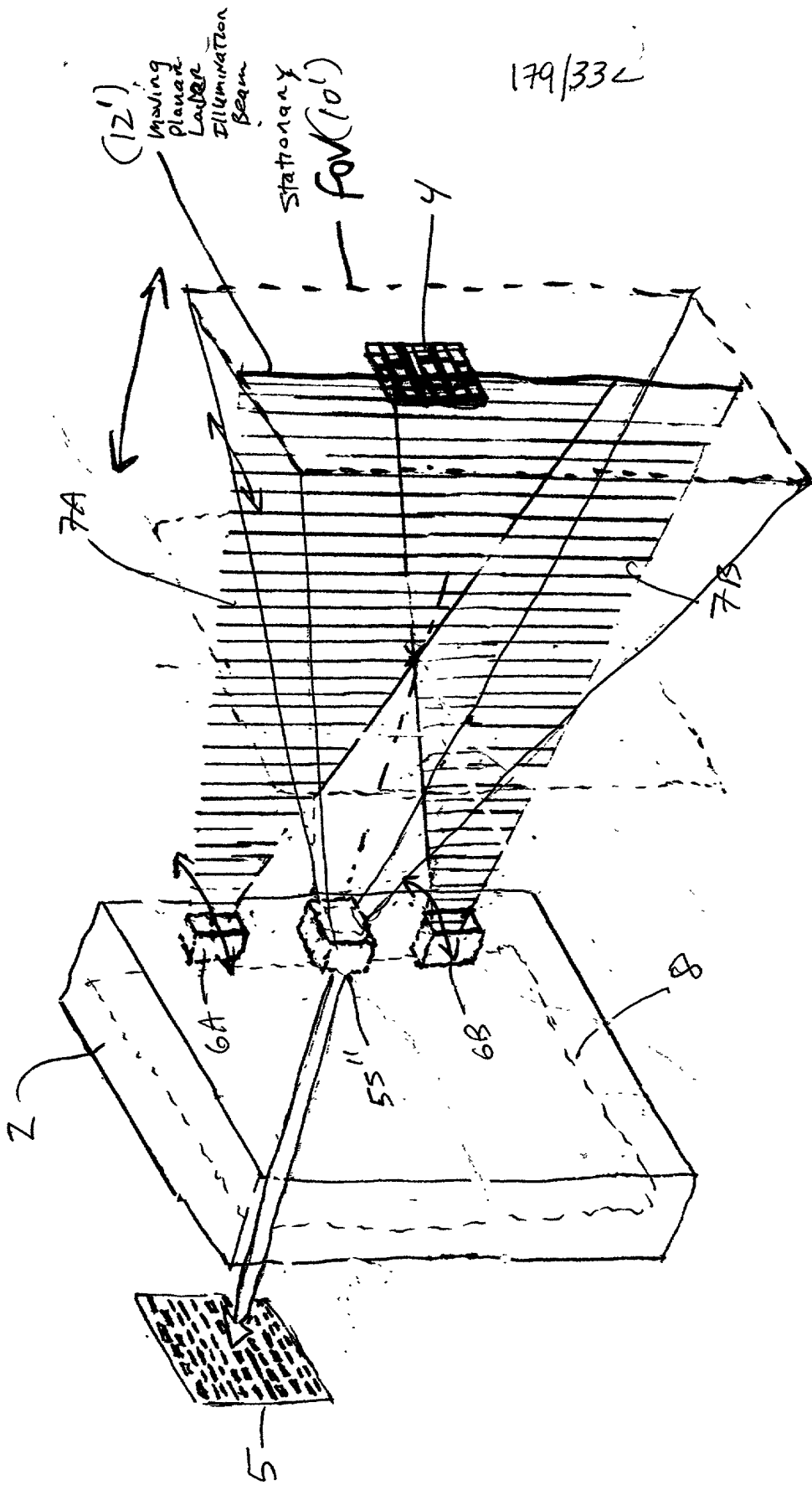


FIG. 6A

86

1007440 004001

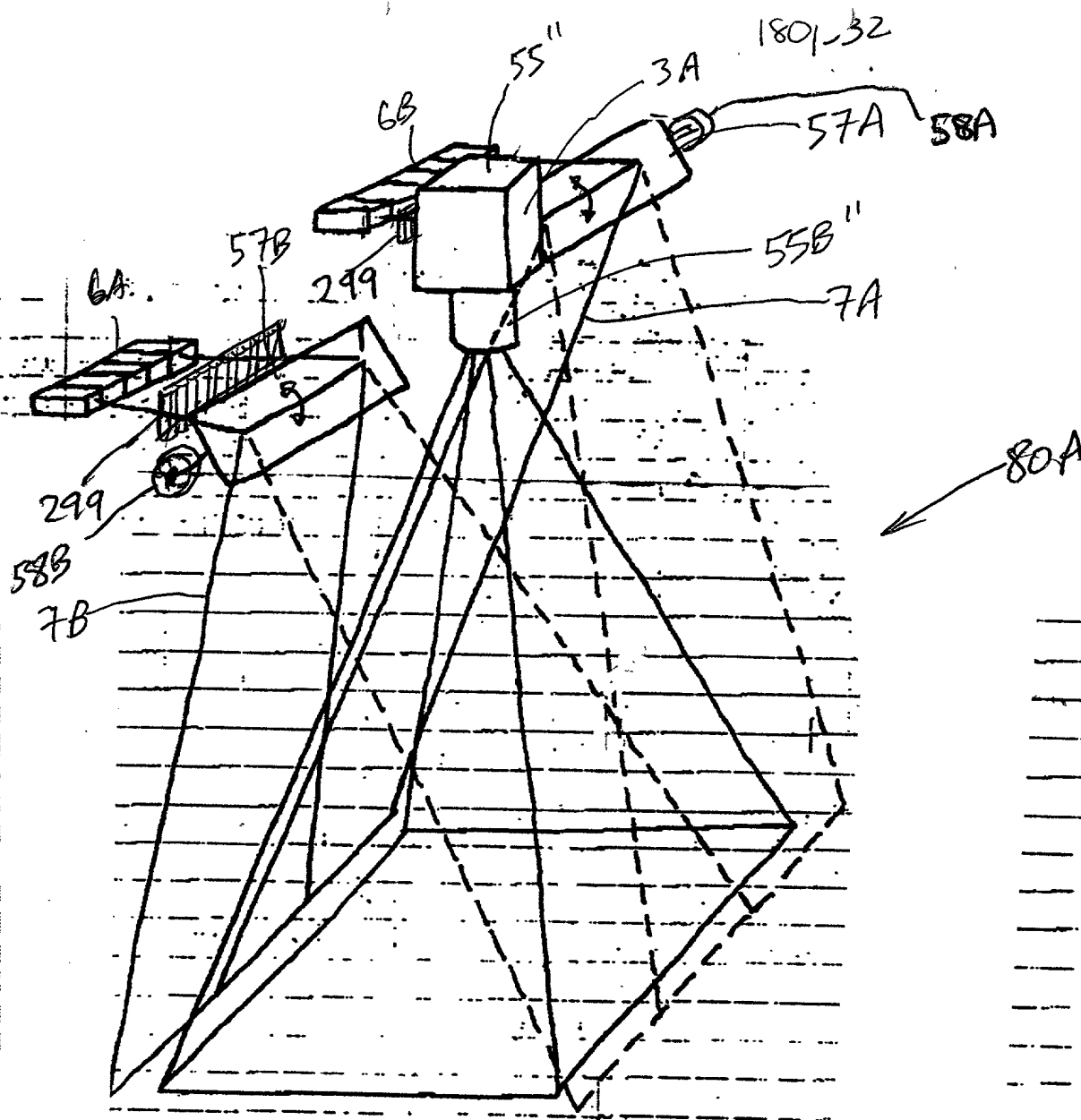
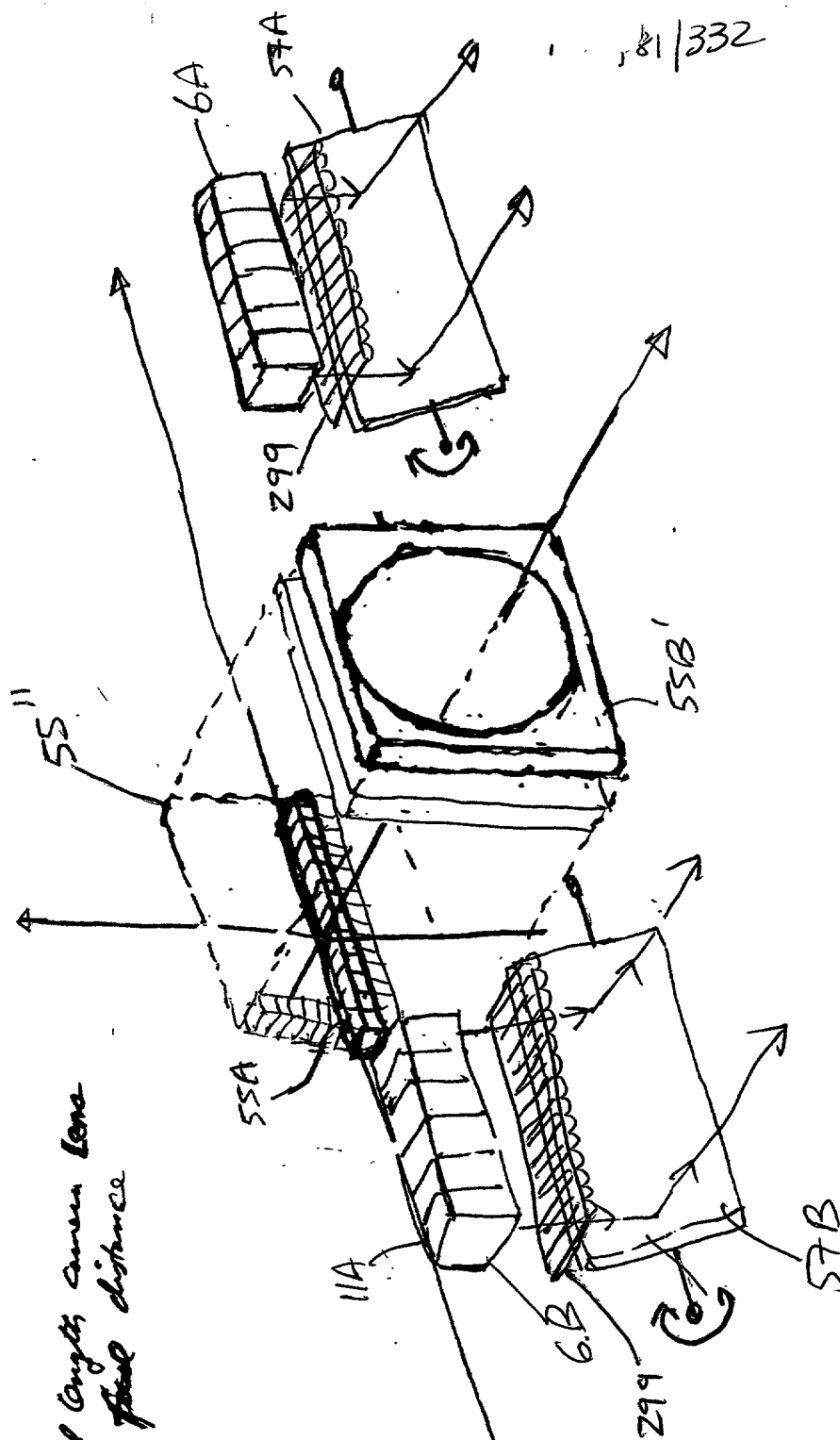


FIG. 6B1

- (1) Variable focal length camera lens
- (2) Variable focal distance



A 00

FIG. 6B2

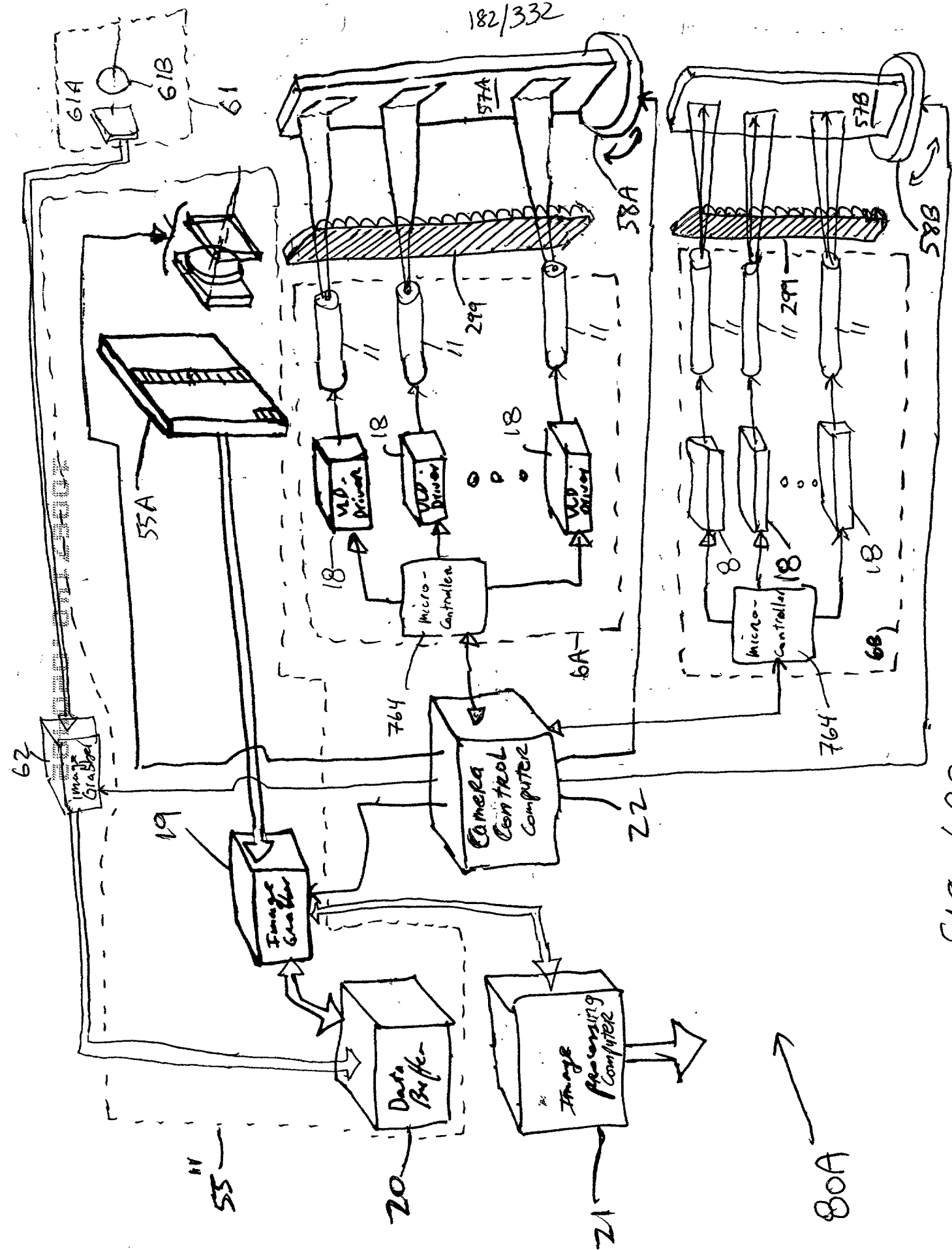


Fig. 6B3

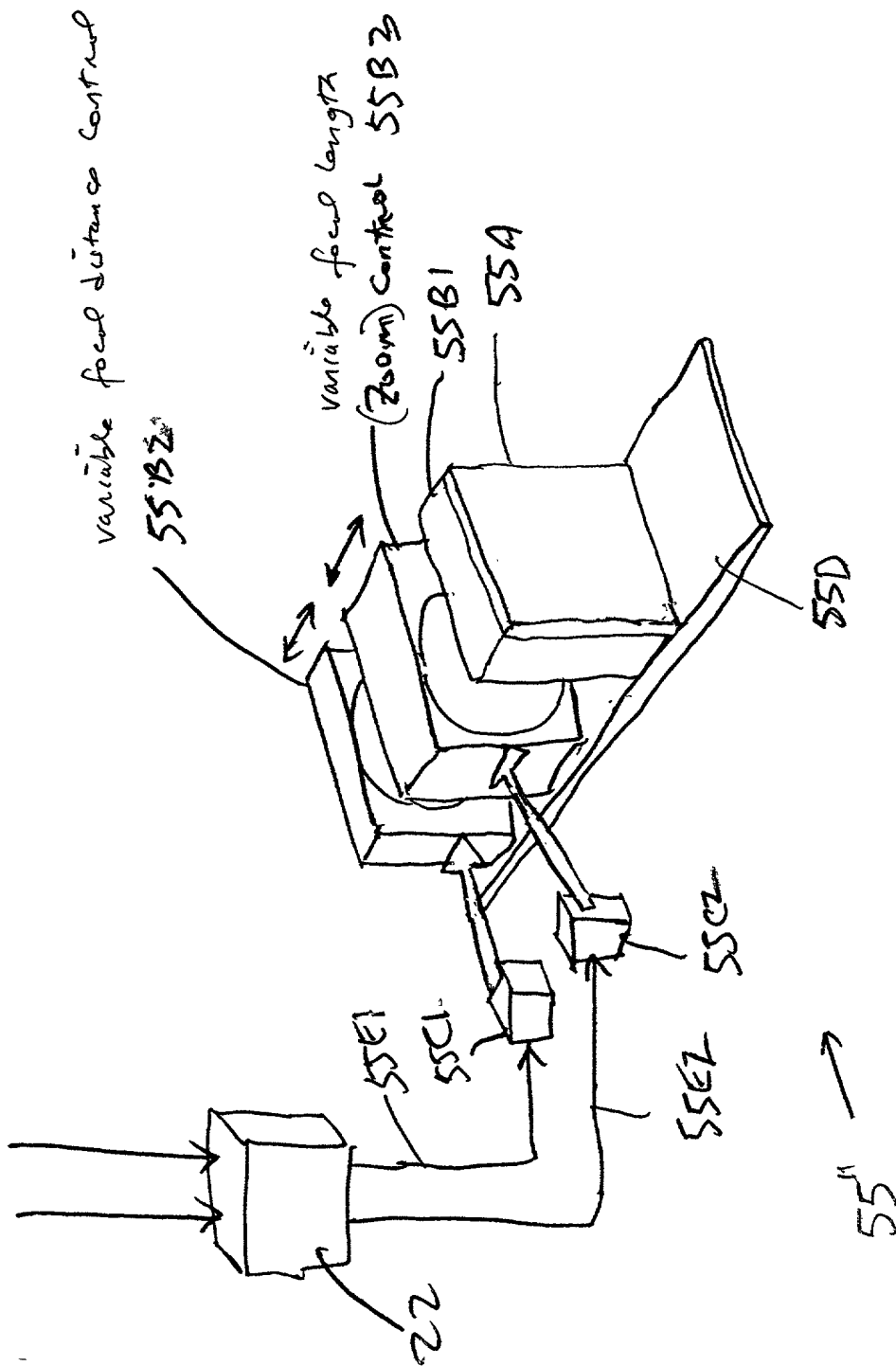


FIG. 6B4

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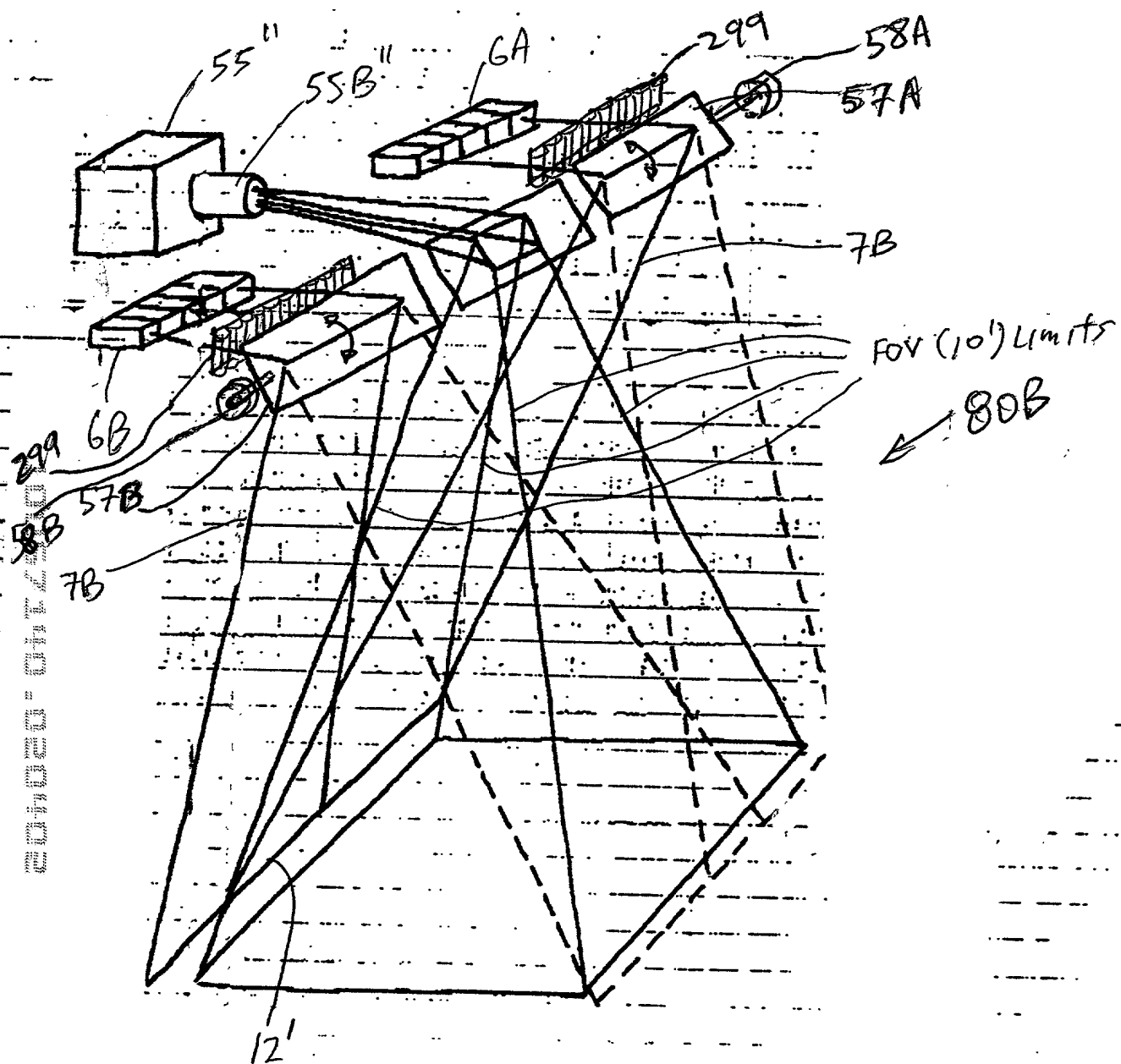


FIG. 6C1

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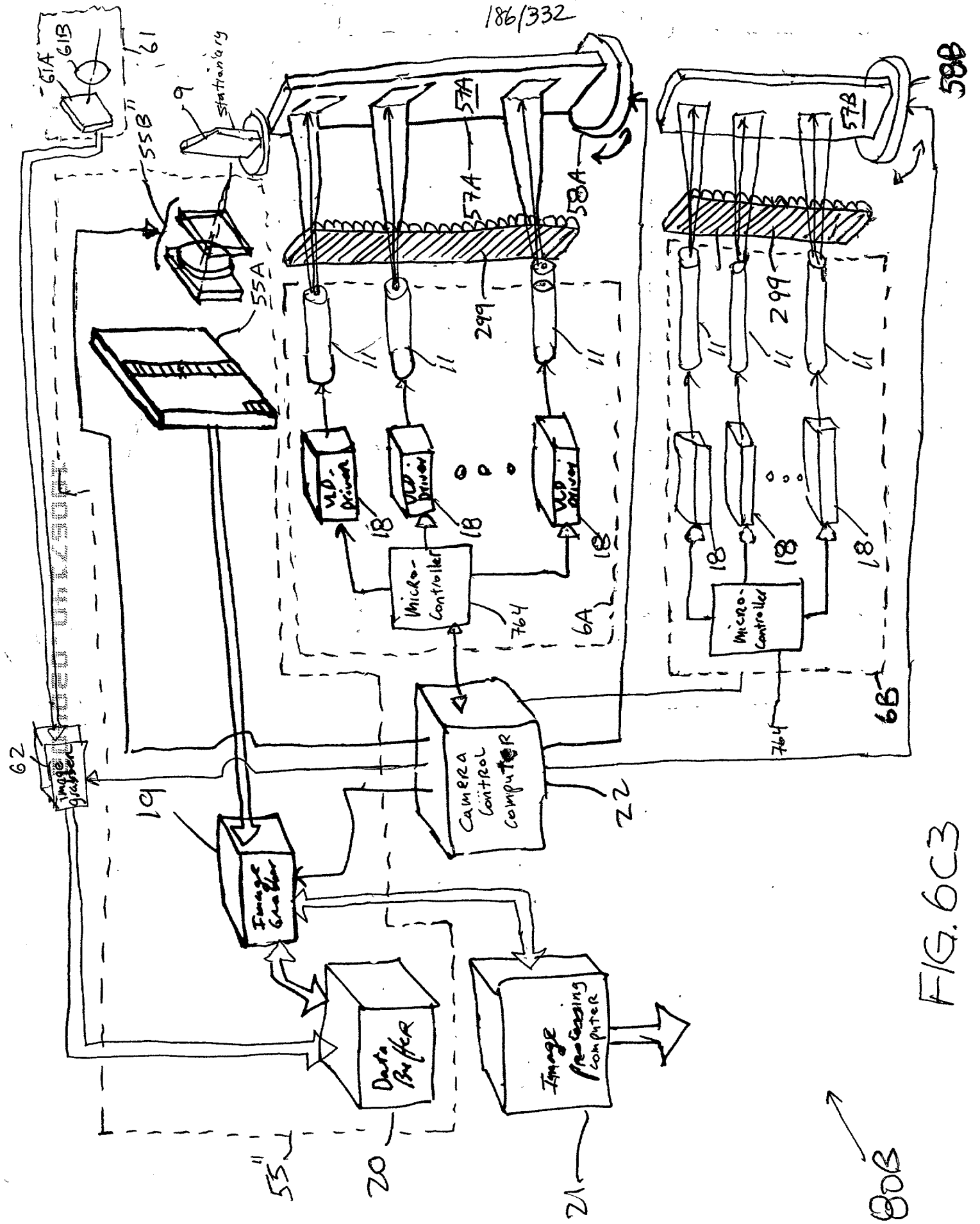


FIG. 6C3

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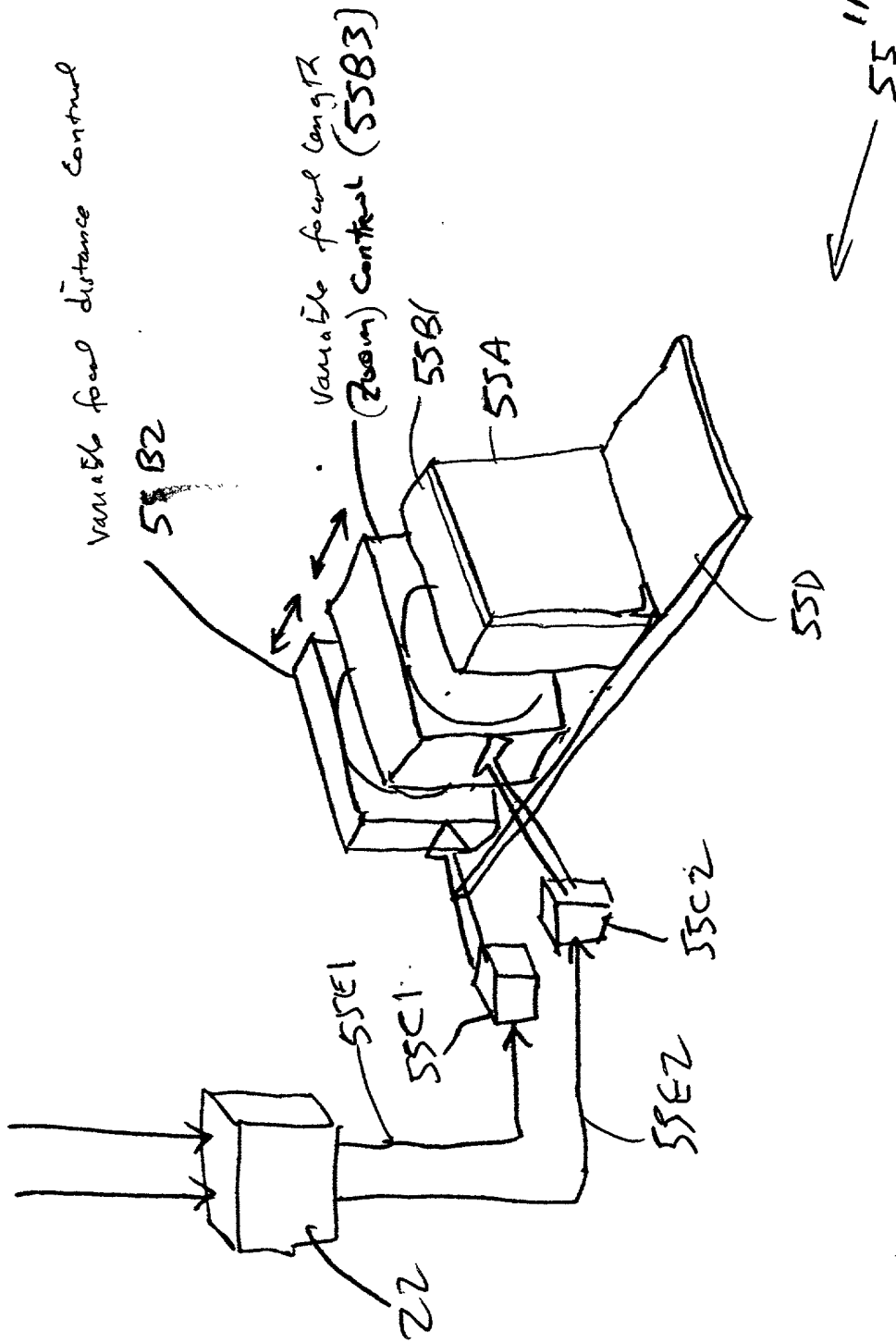


FIG. 6C4

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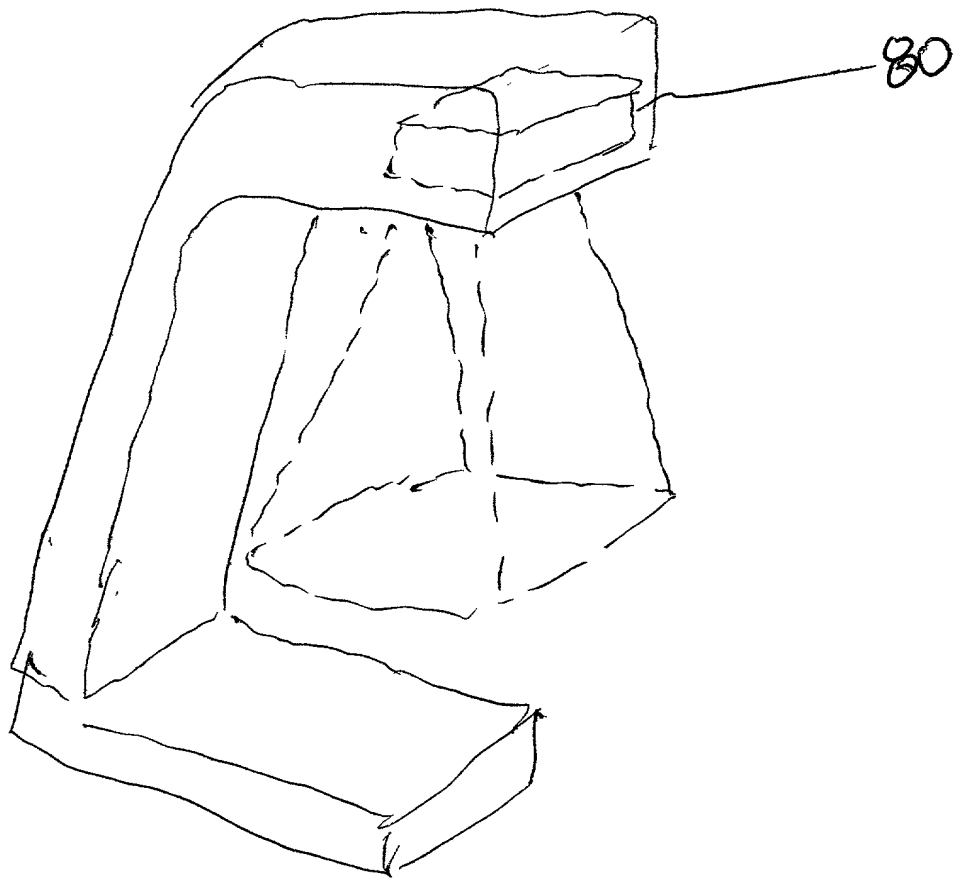
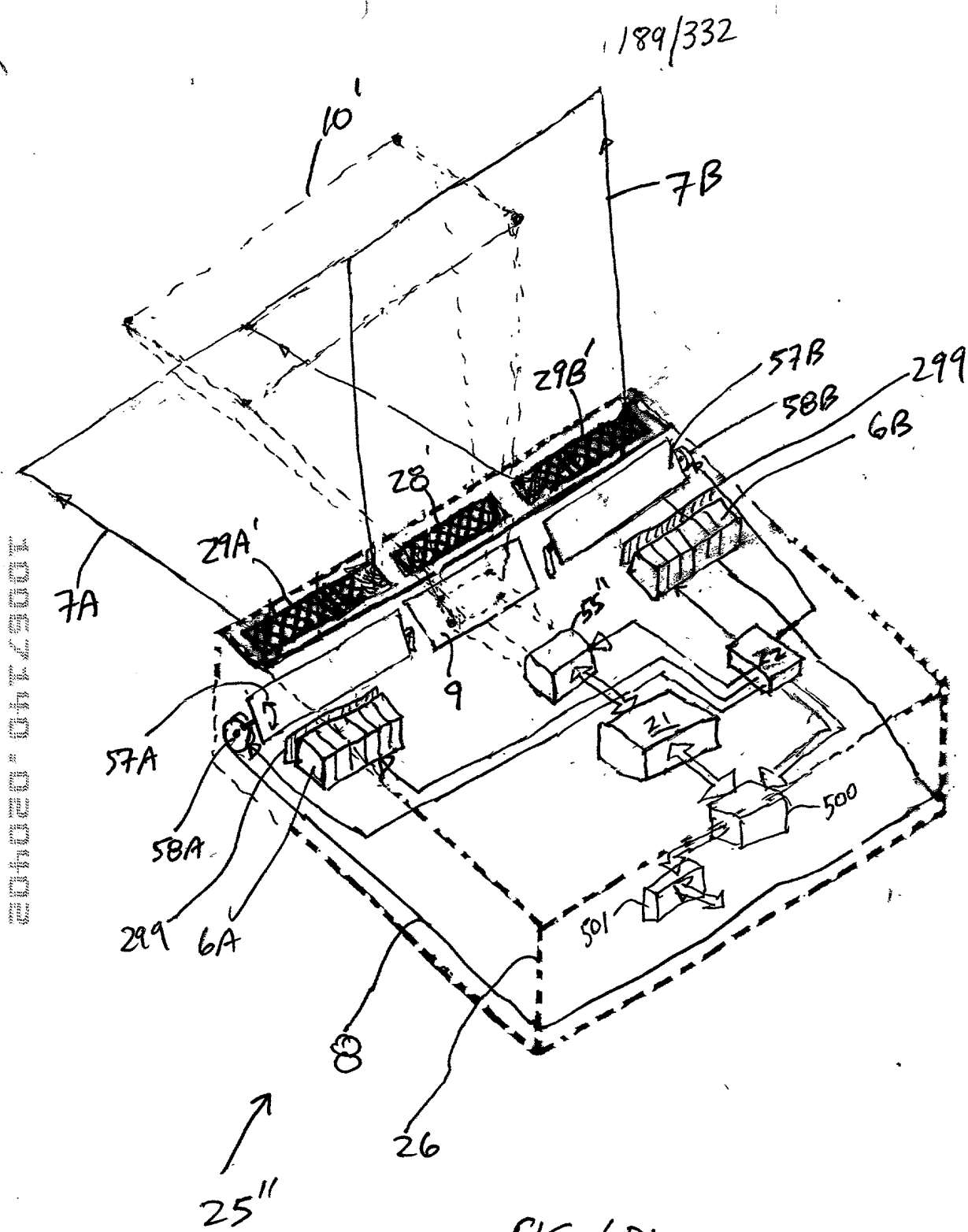


FIG. 6C5



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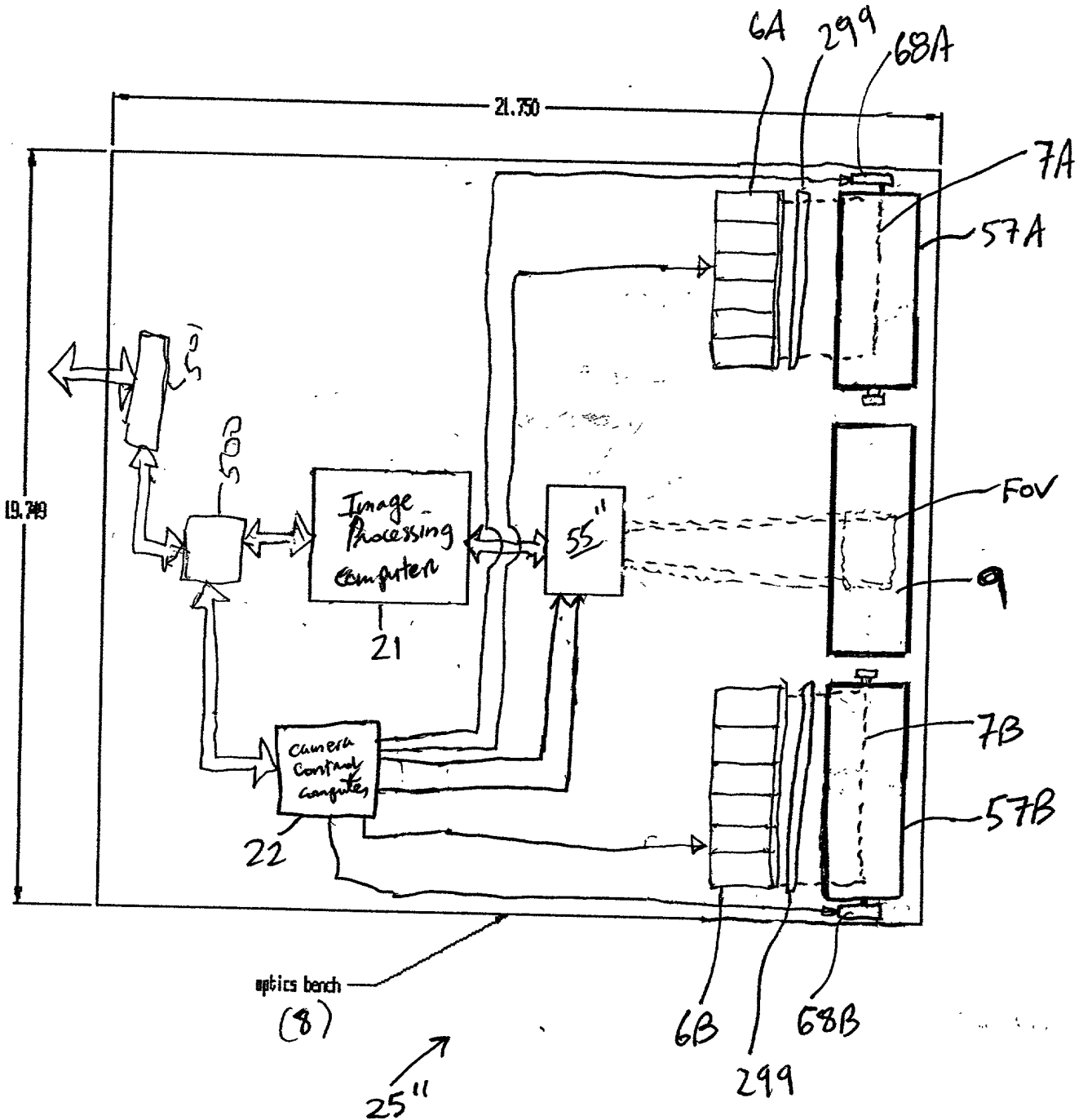


FIG. 6D2

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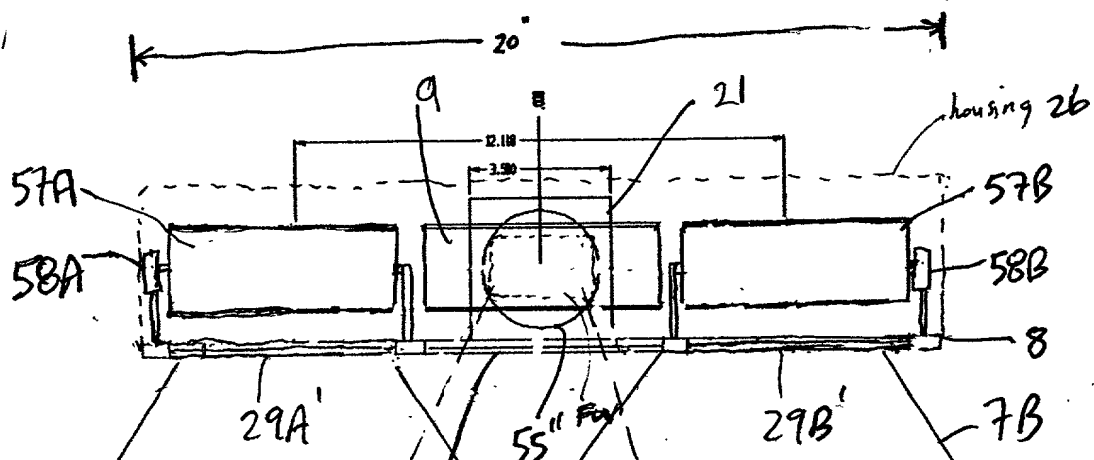


FIG. 6D3

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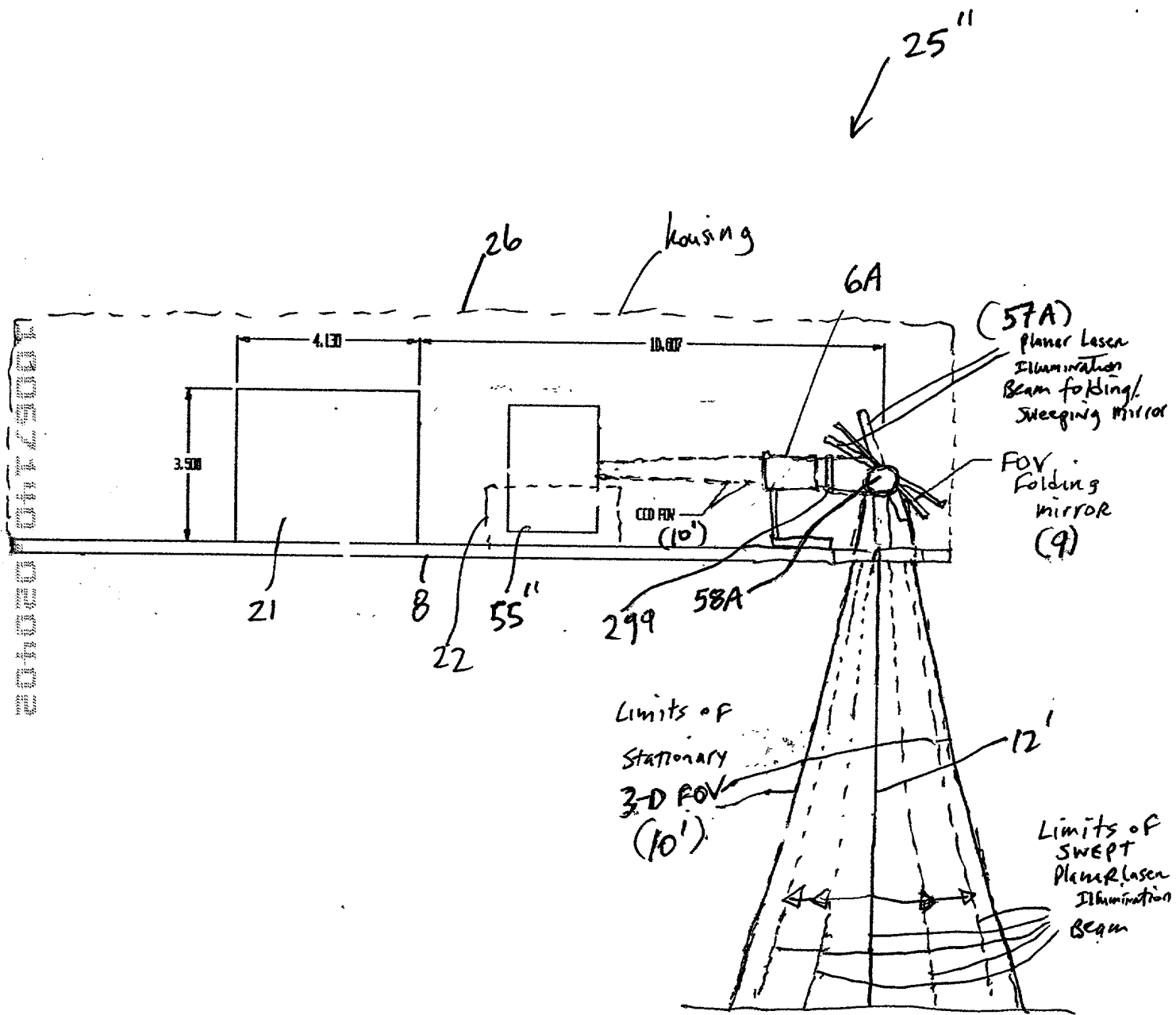


FIG. 6D4

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variable FOV

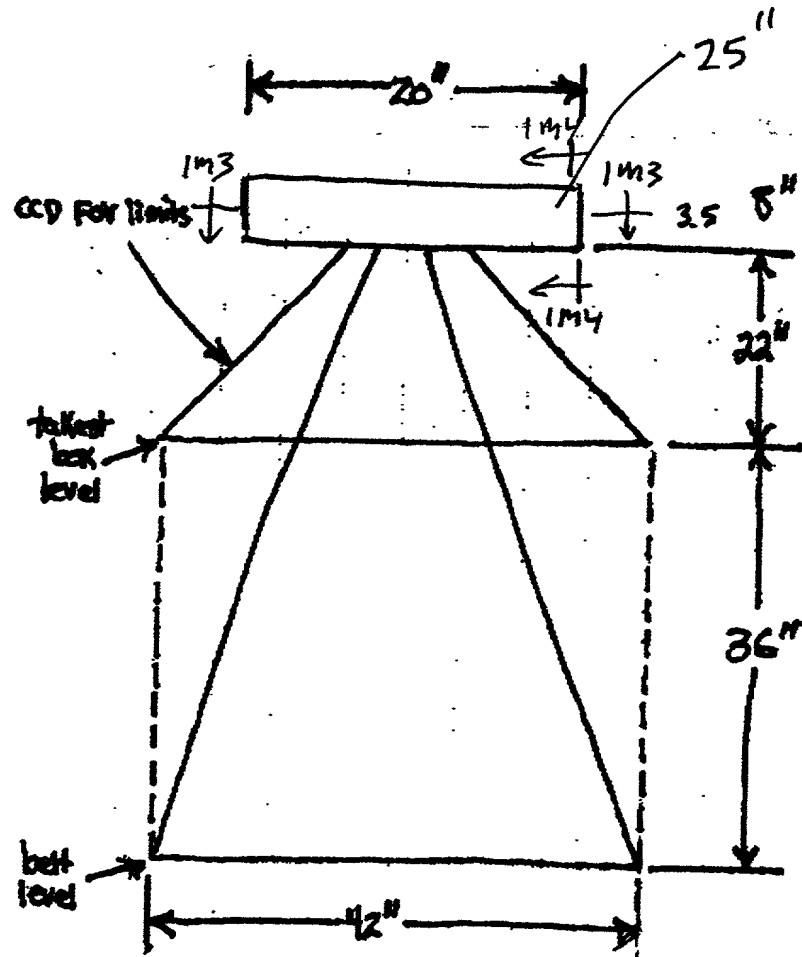


FIG. 6D5

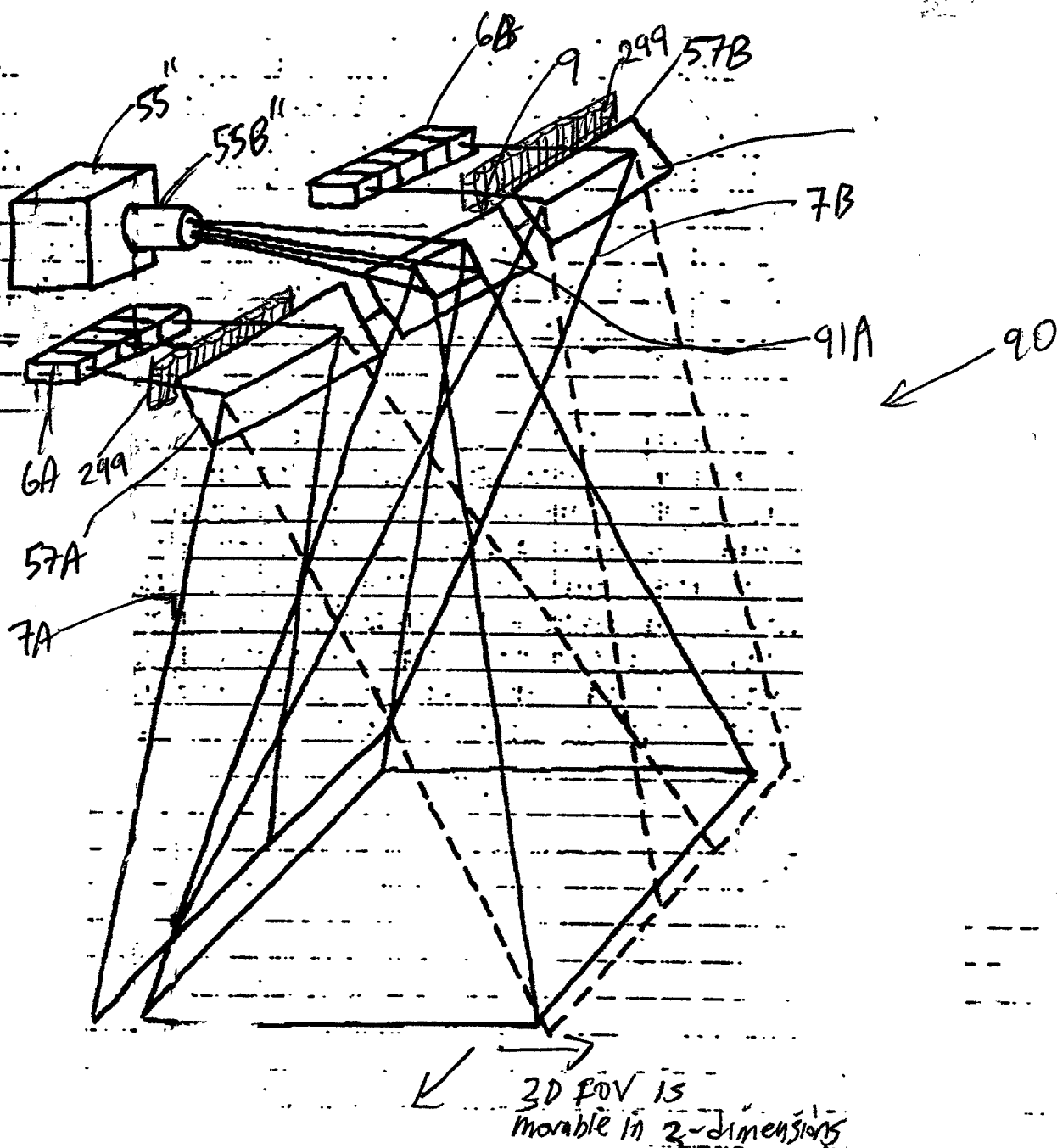
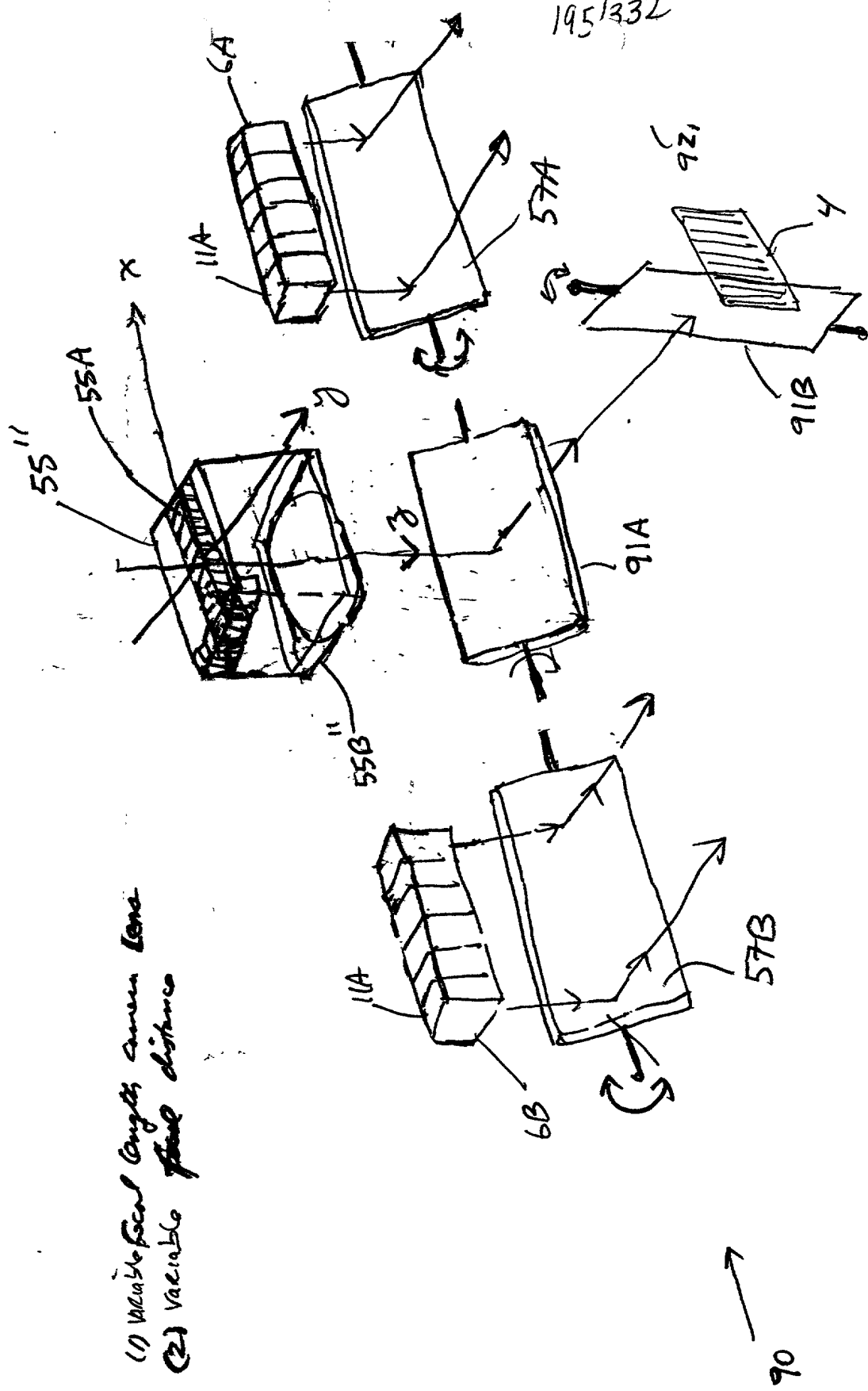


FIG 6E1

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- (1) Variable focal length camera lens
- (2) Variable focal distance

FIG. 6E2

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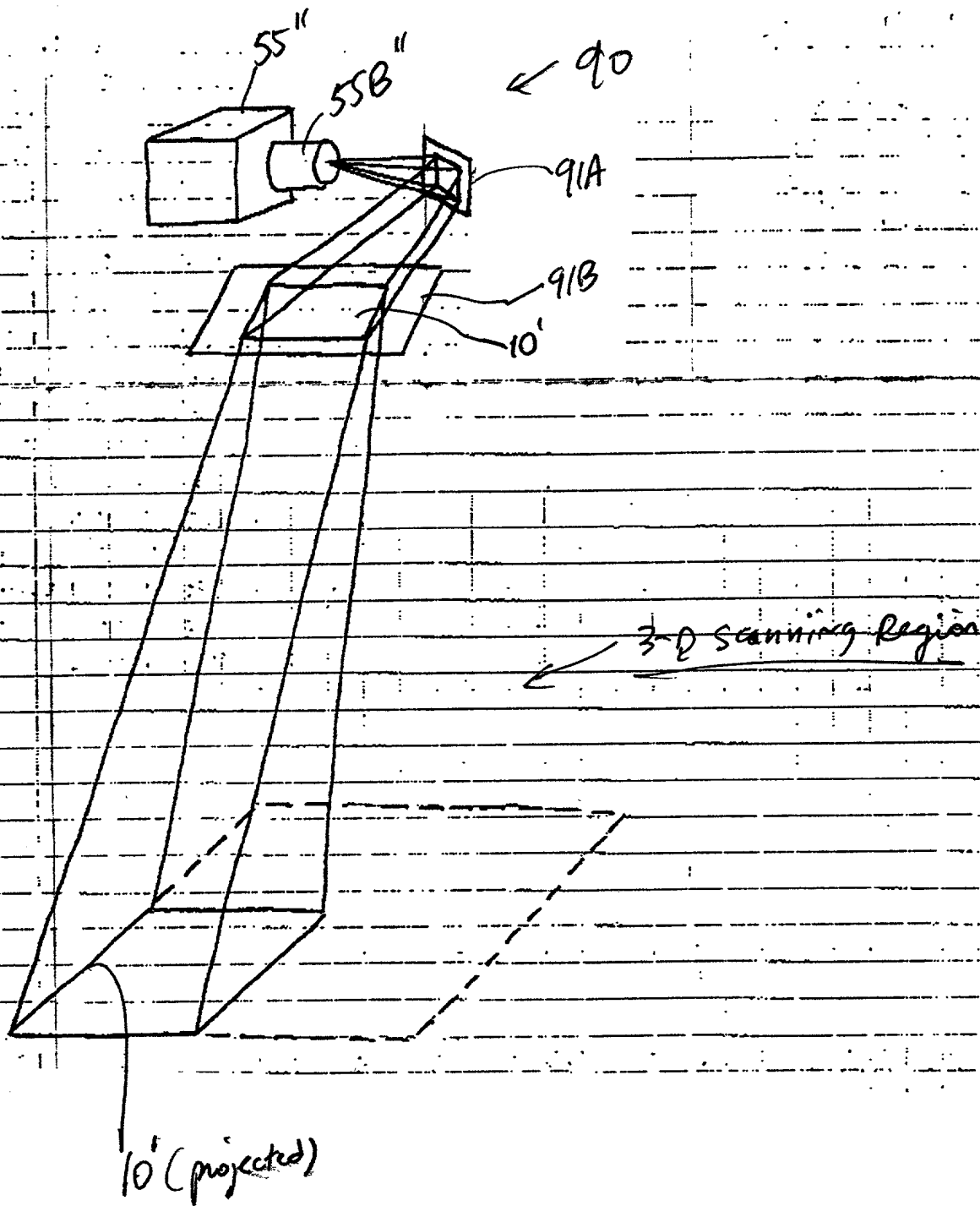


FIG. 6E4

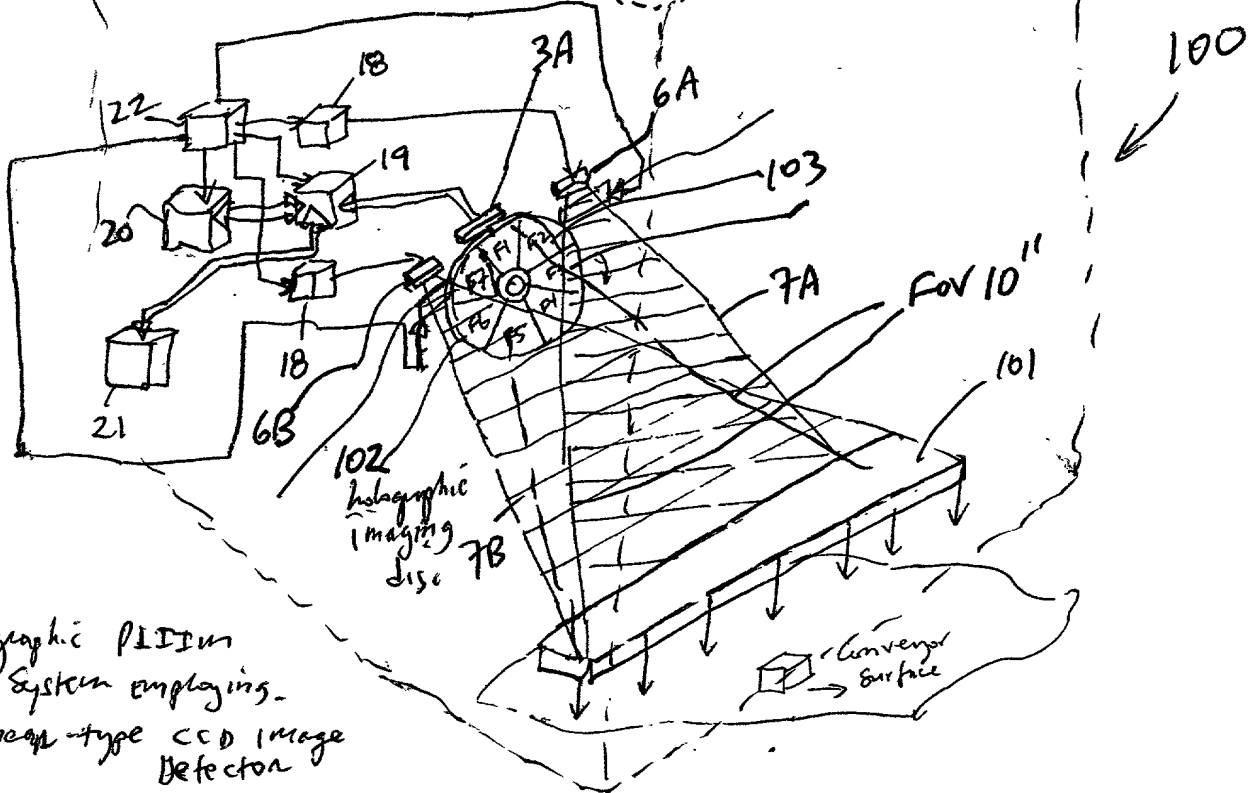


FIG. 7A

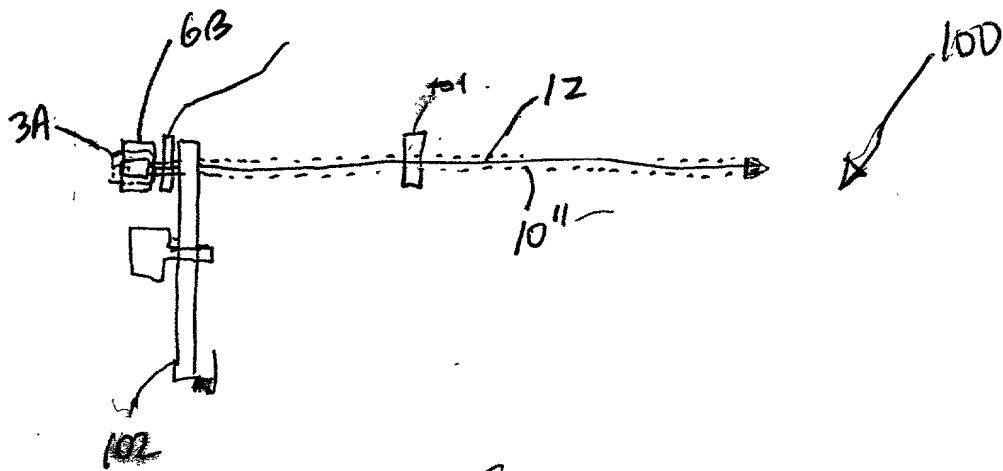


FIG. 7B

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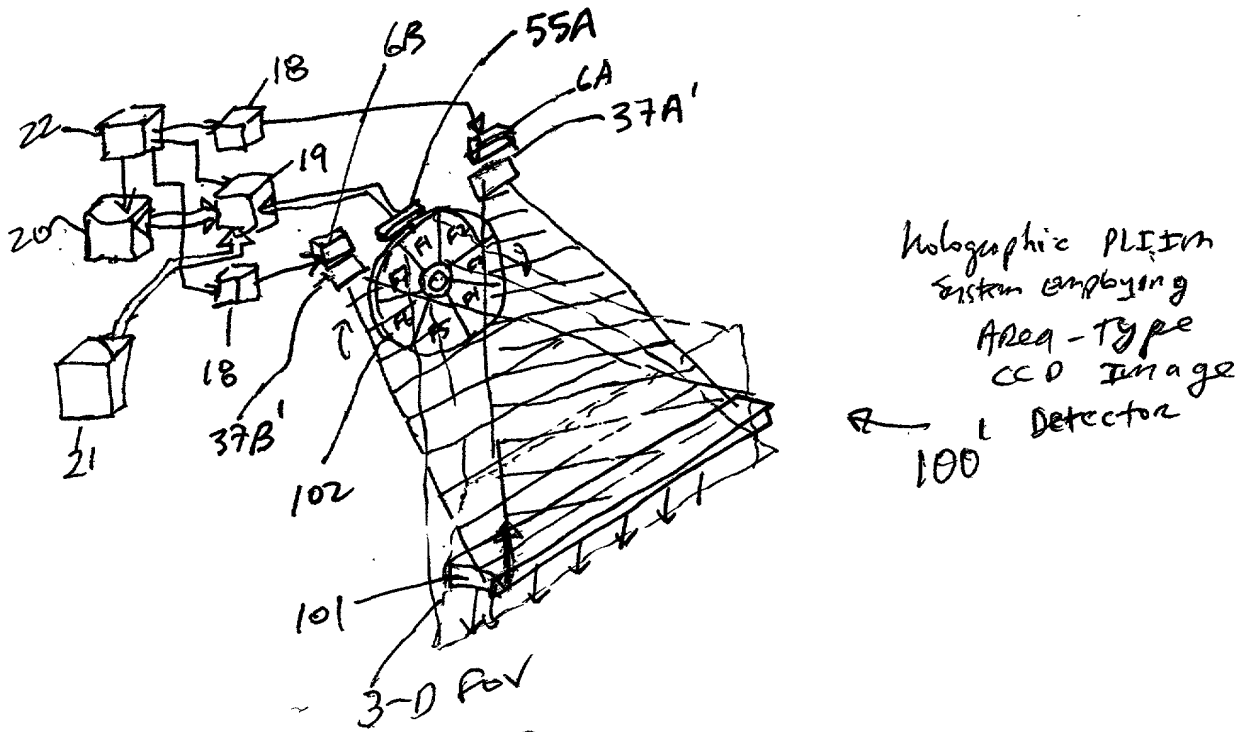


FIG. 8A

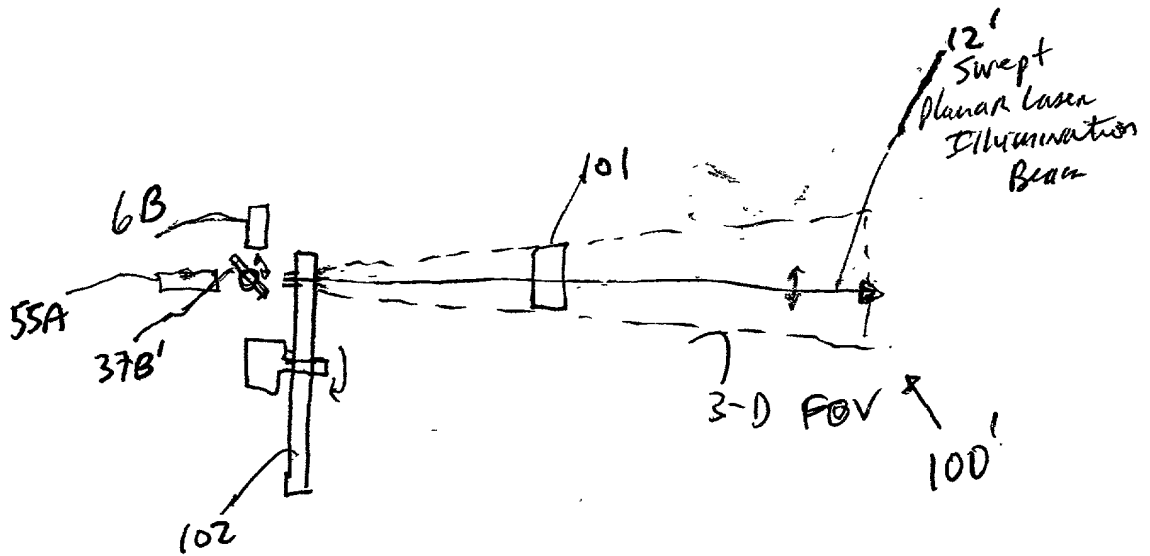


FIG. 8B

100440-2040

1-D CCD SCANNER EMBODIMENT

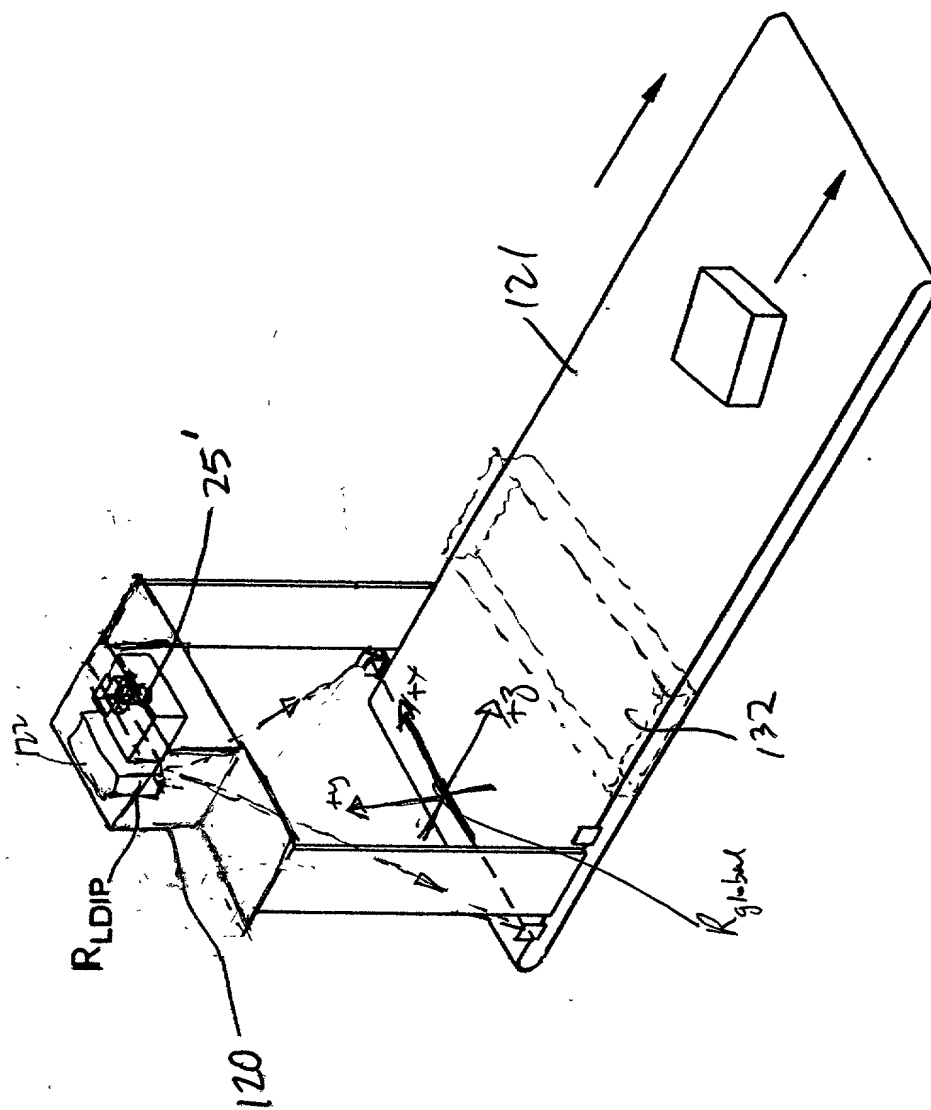


FIG. 9

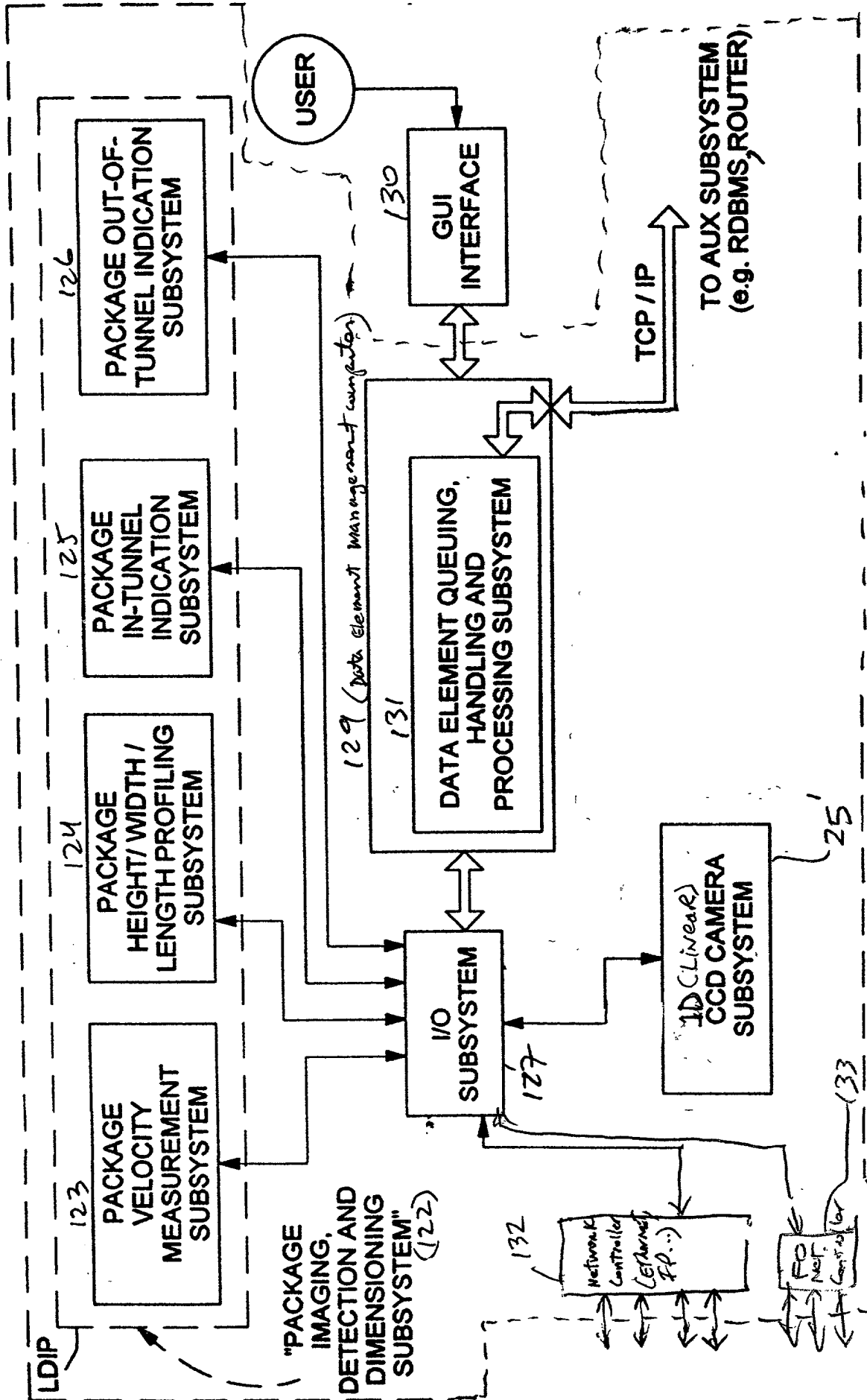


FIG. 10

120

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FIG. 11

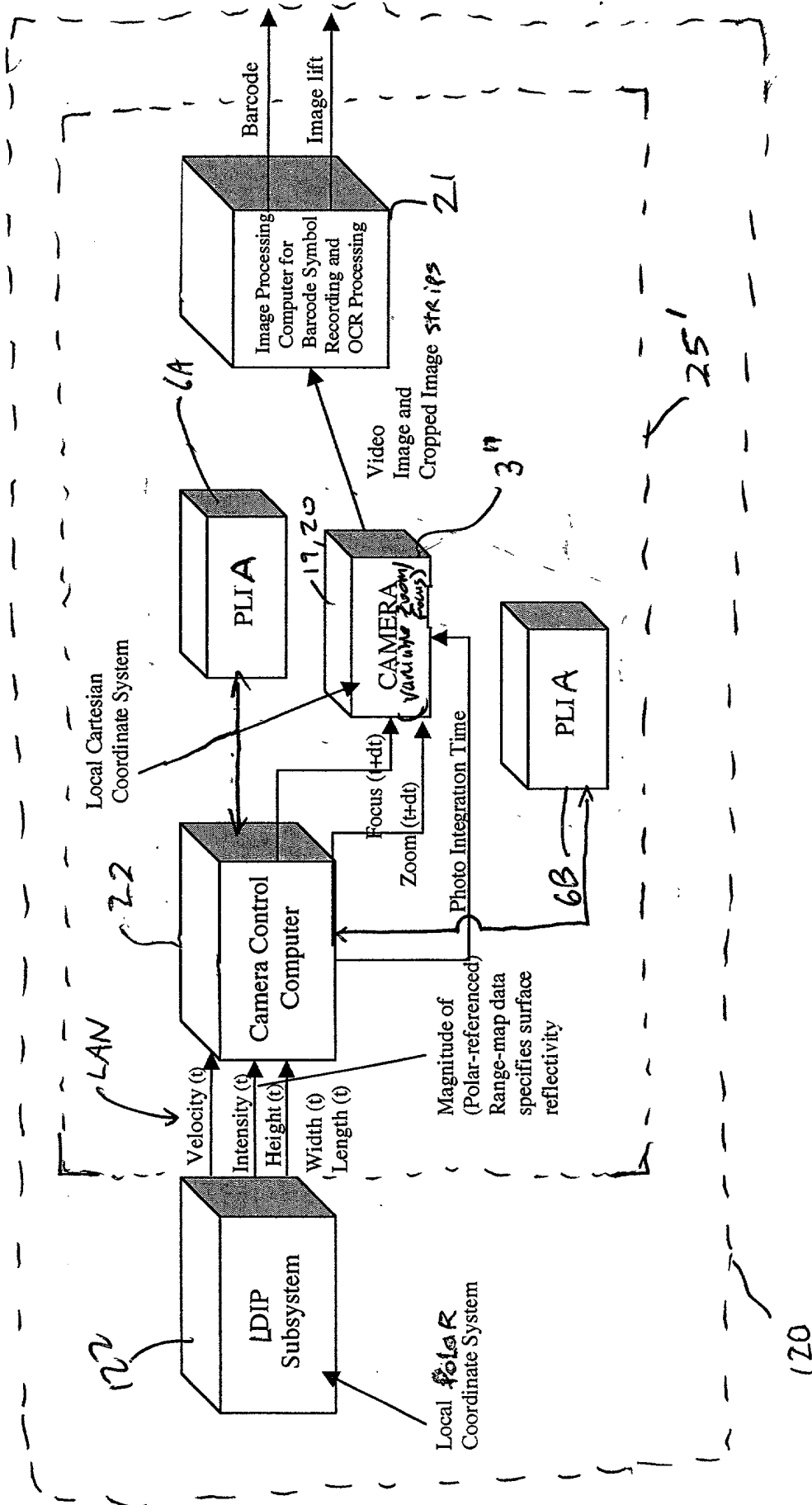


FIG. 11

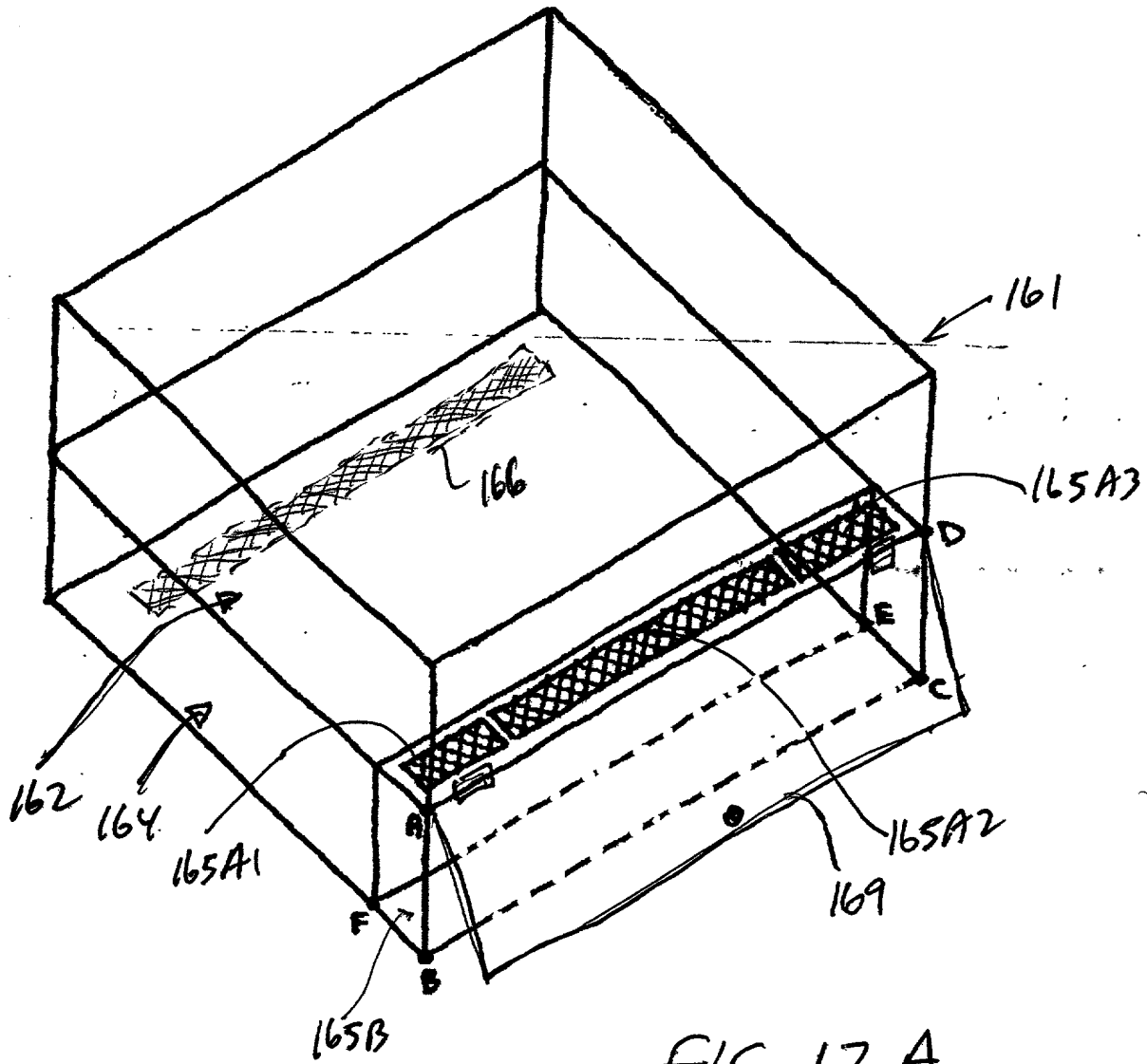


FIG. 12A

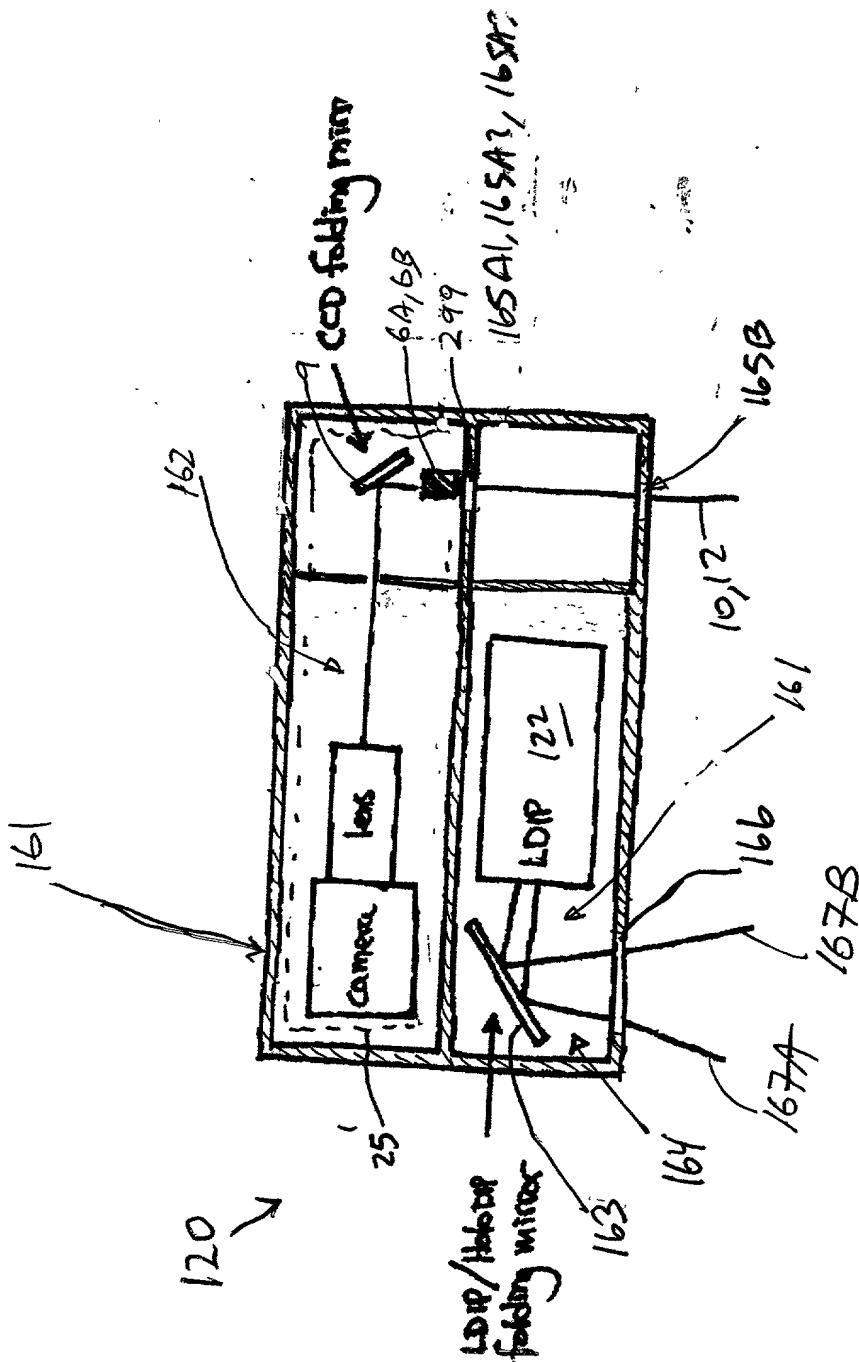


FIG. 12B

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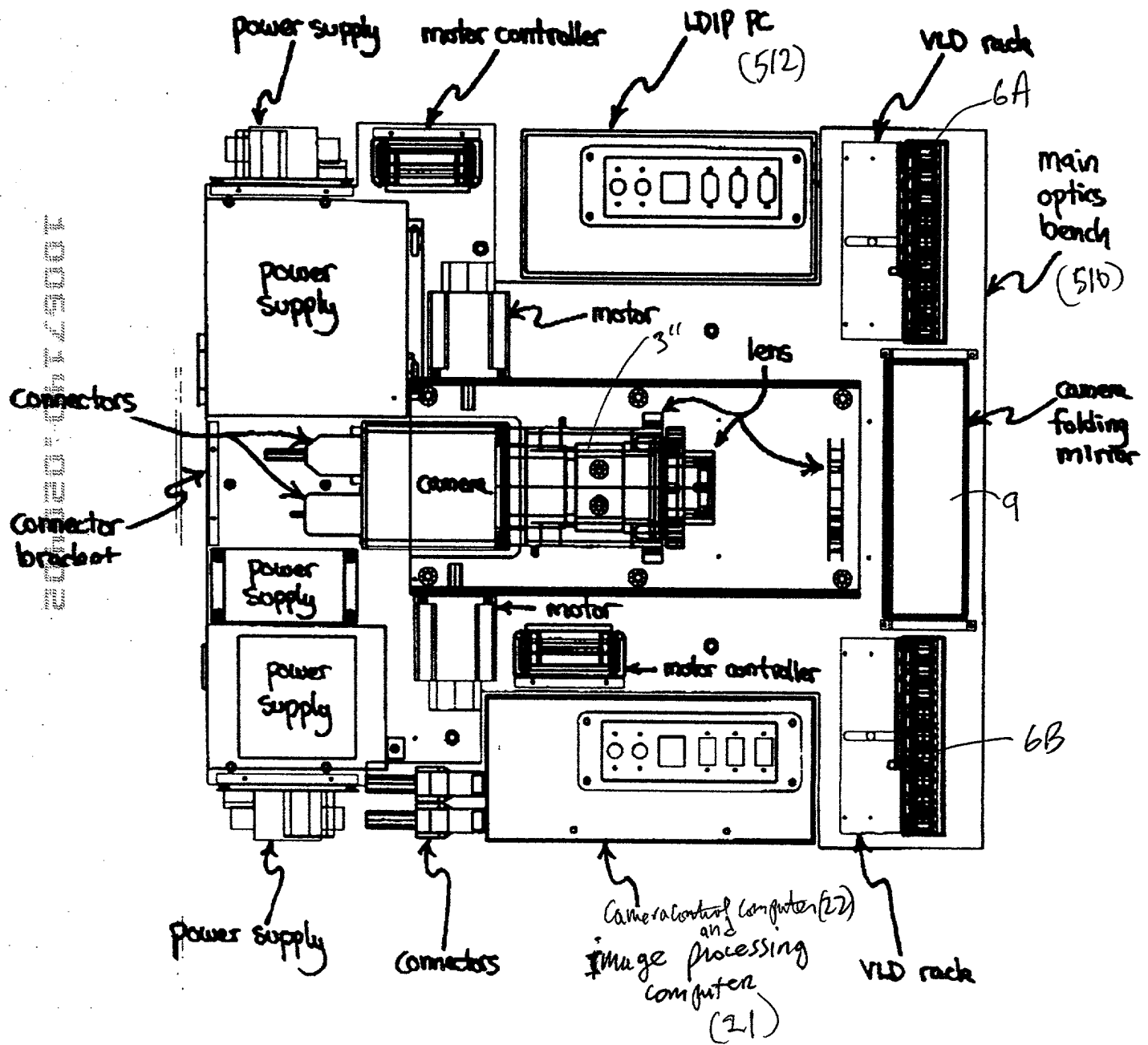


FIG. 12C

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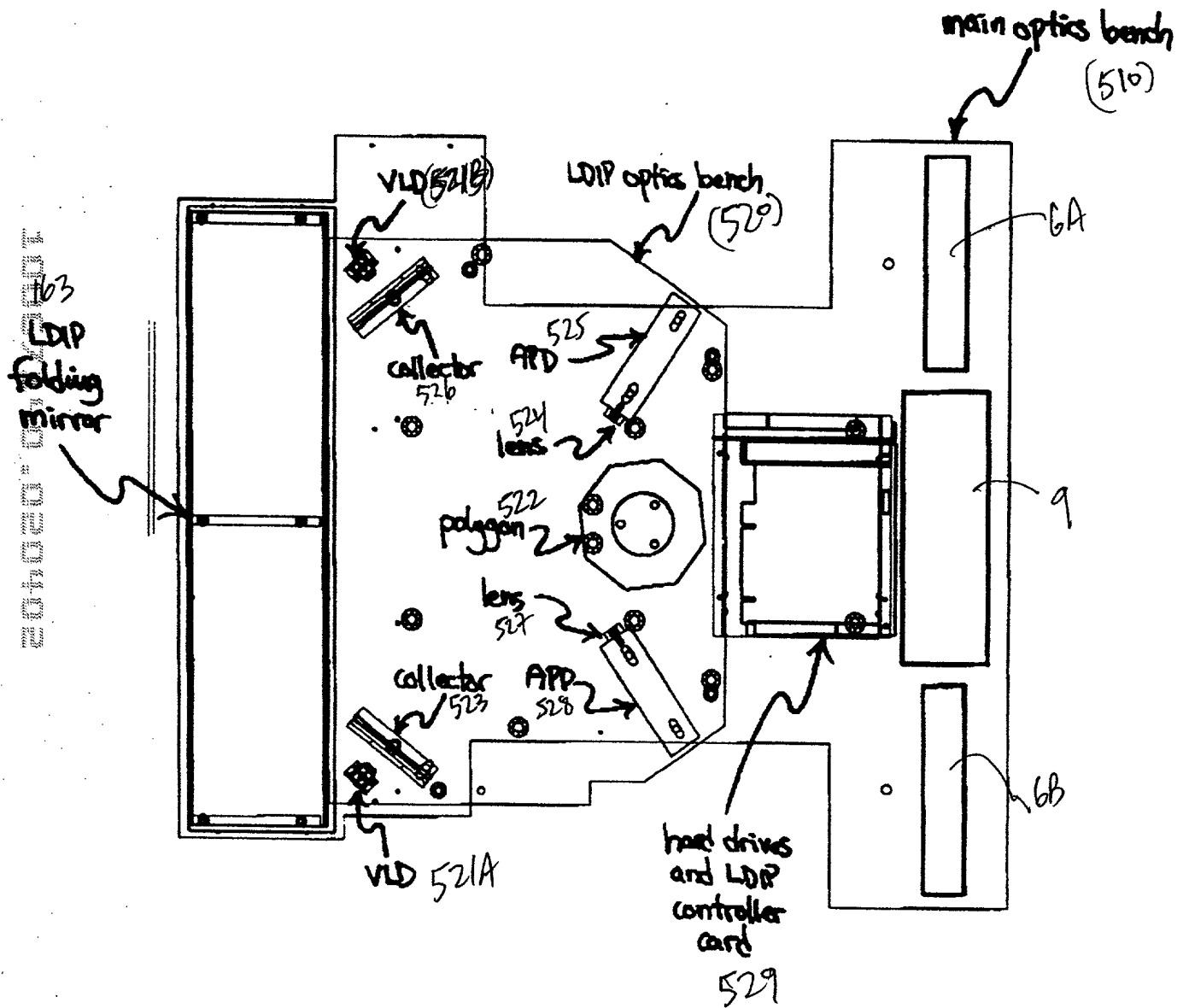
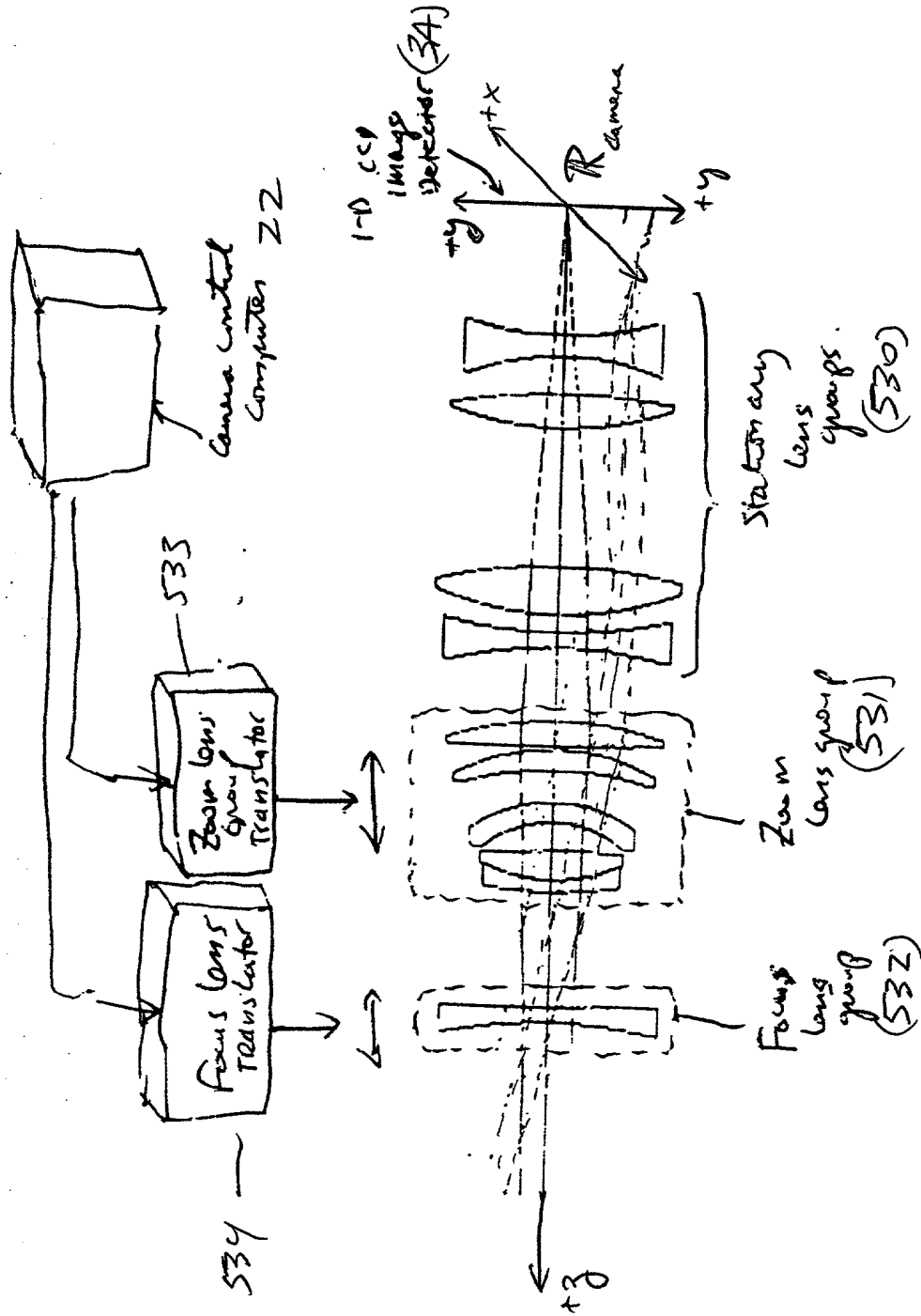


FIG. 12D

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(main optics)
(lens groups)

FIG. 12E

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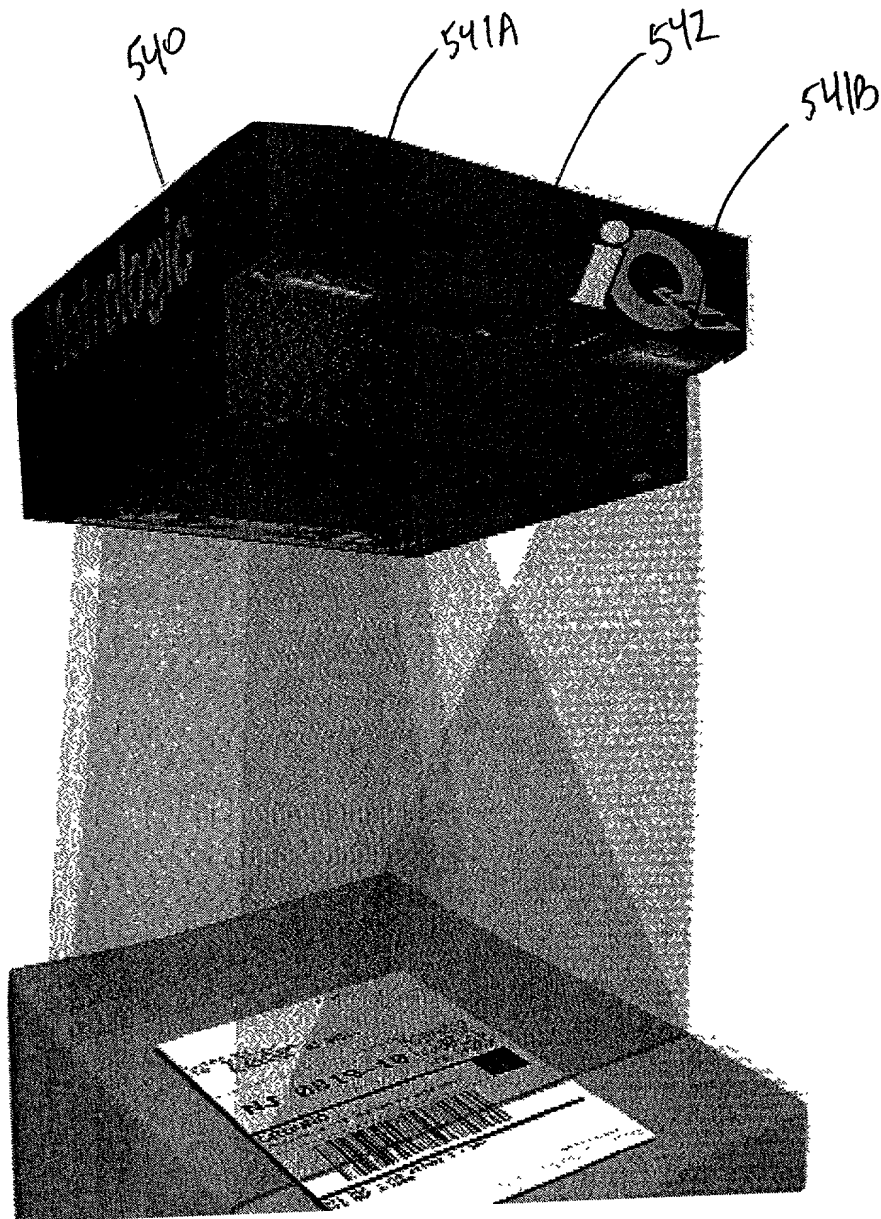


FIG. 13A

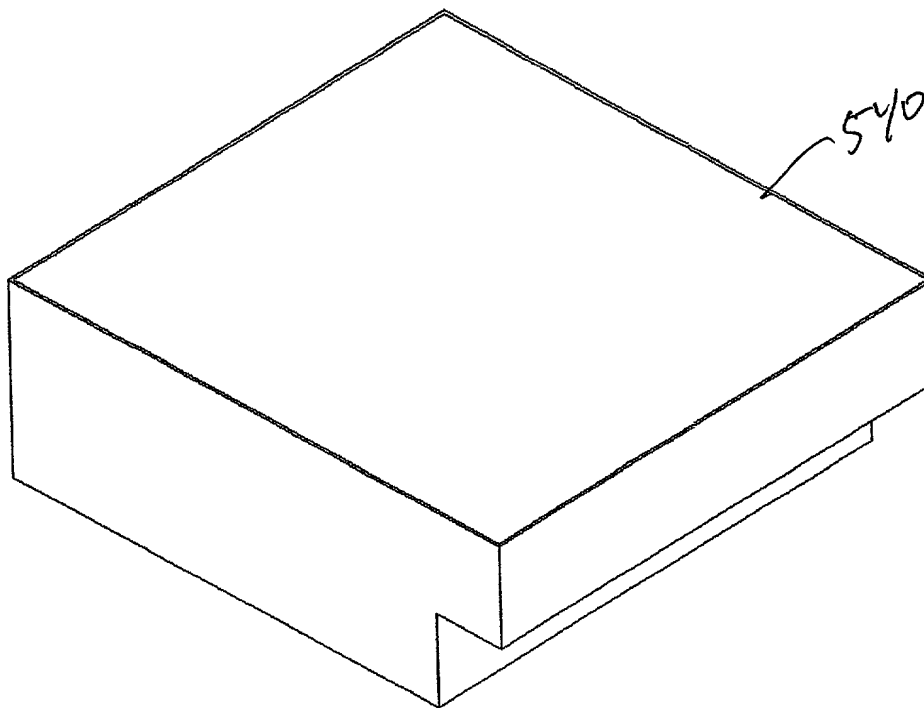


FIG. 13B

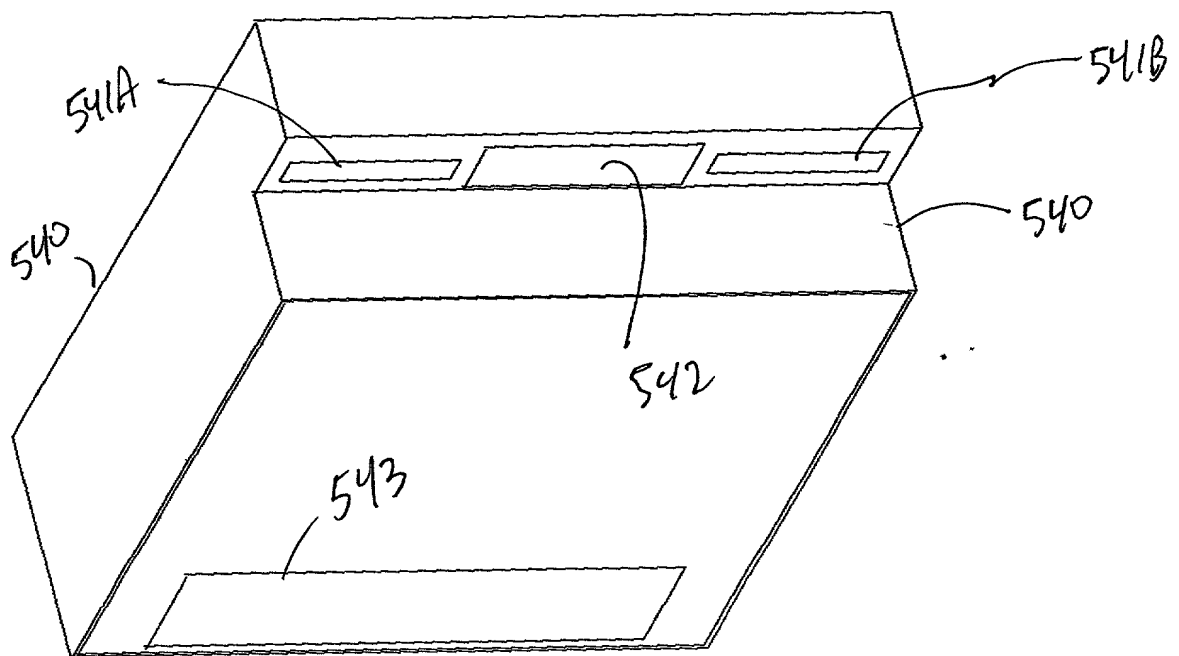


FIG. 13C

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PLLIM-BASED PACKAGE IDENTIFICATION AND DIMENSIONING (PID) SYSTEM

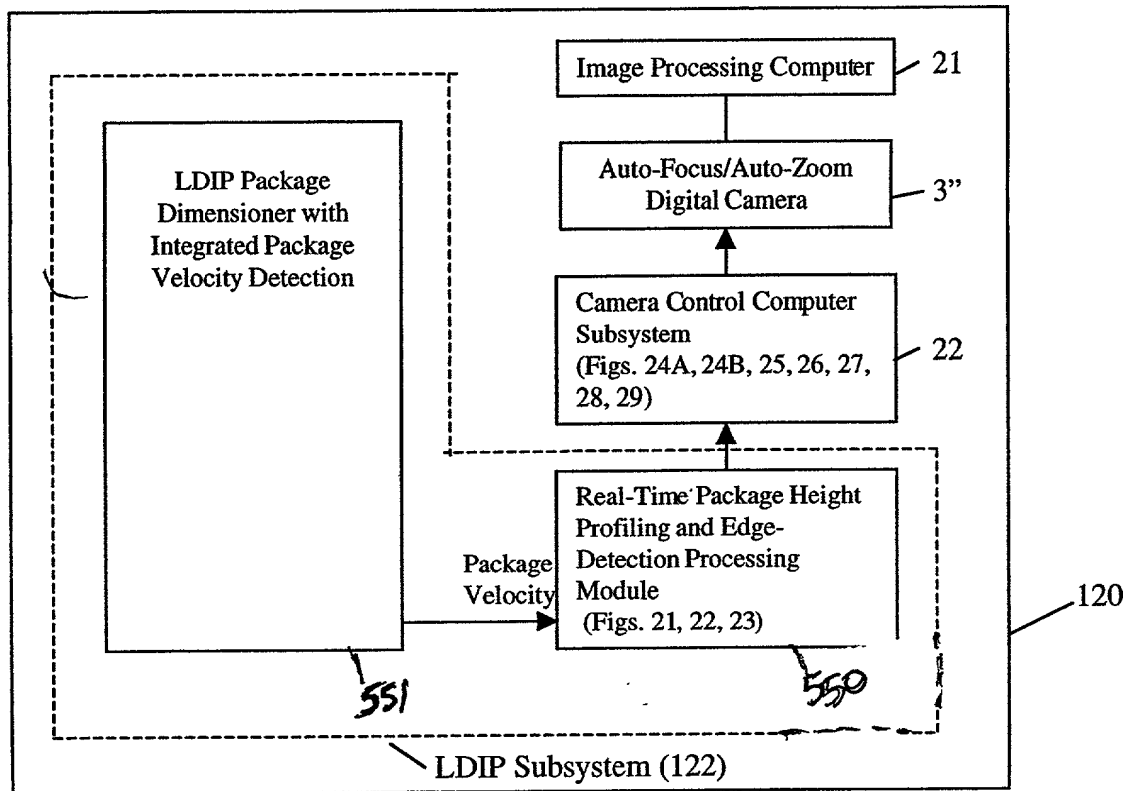


FIG. 14

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LDIP REAL-TIME PACKAGE HEIGHT PROFILE AND EDGE DETECTION METHOD

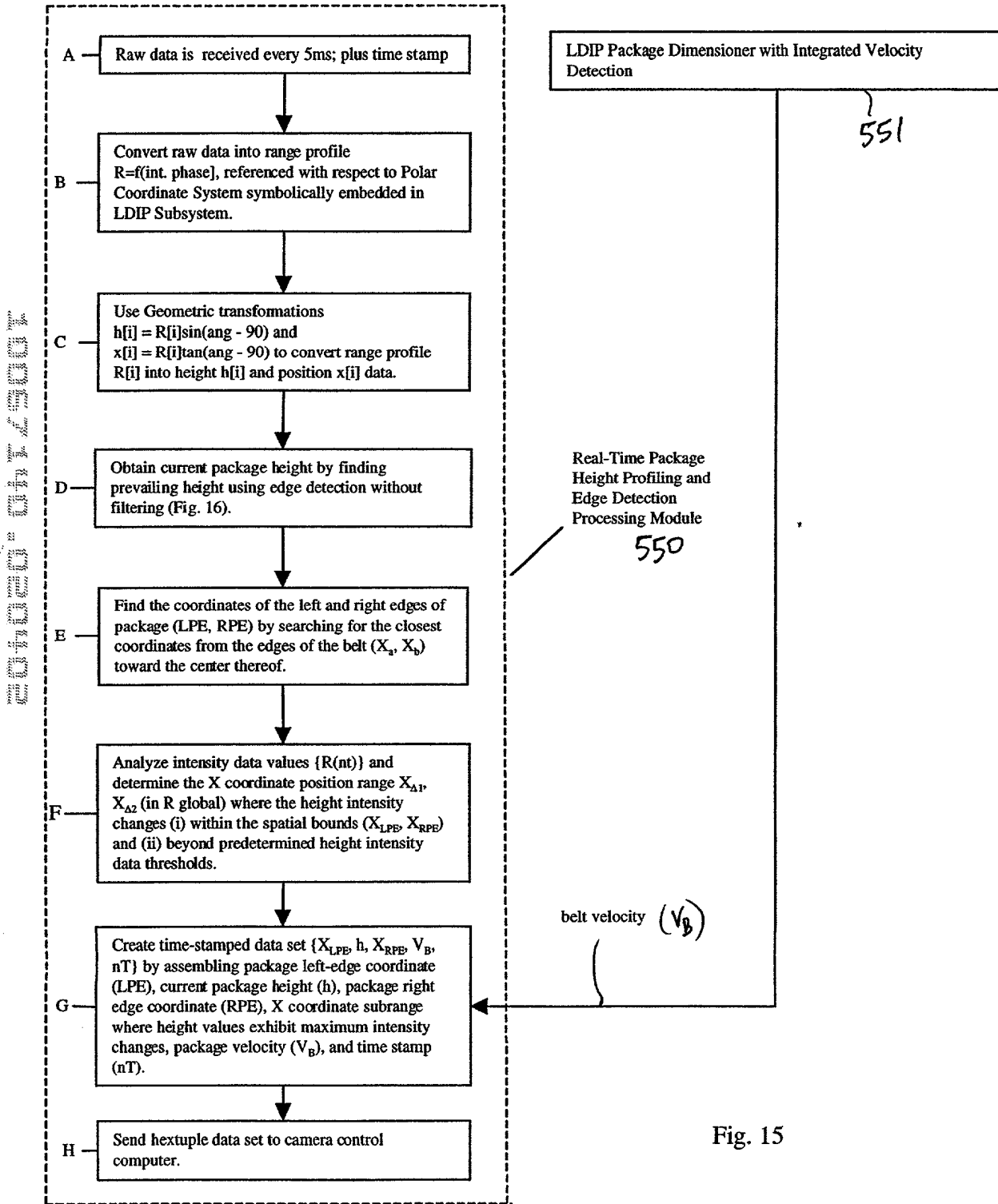
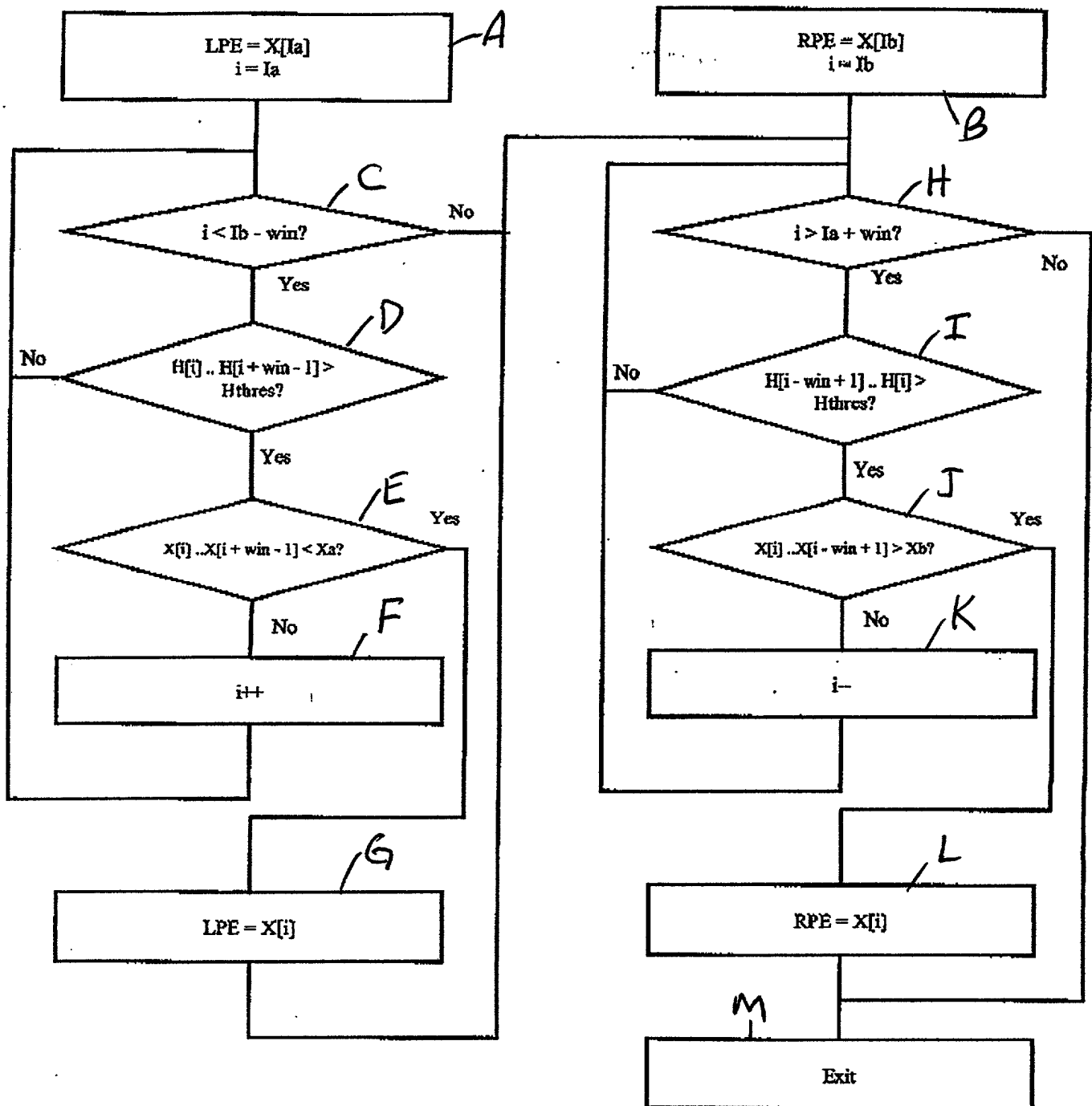


Fig. 15

LDIP Real Time Package Edge Detection



X_a = location of belt left edge; X_b = location of belt right edge
 I_a = belt edge edge pixel; I_b = belt right edge pixel
 LPE = Left package edge; RPE = Right package edge
 $H[]$ = Pixel height array; $X[]$ = Pixel location array
 win = package detection window

FIG. 16

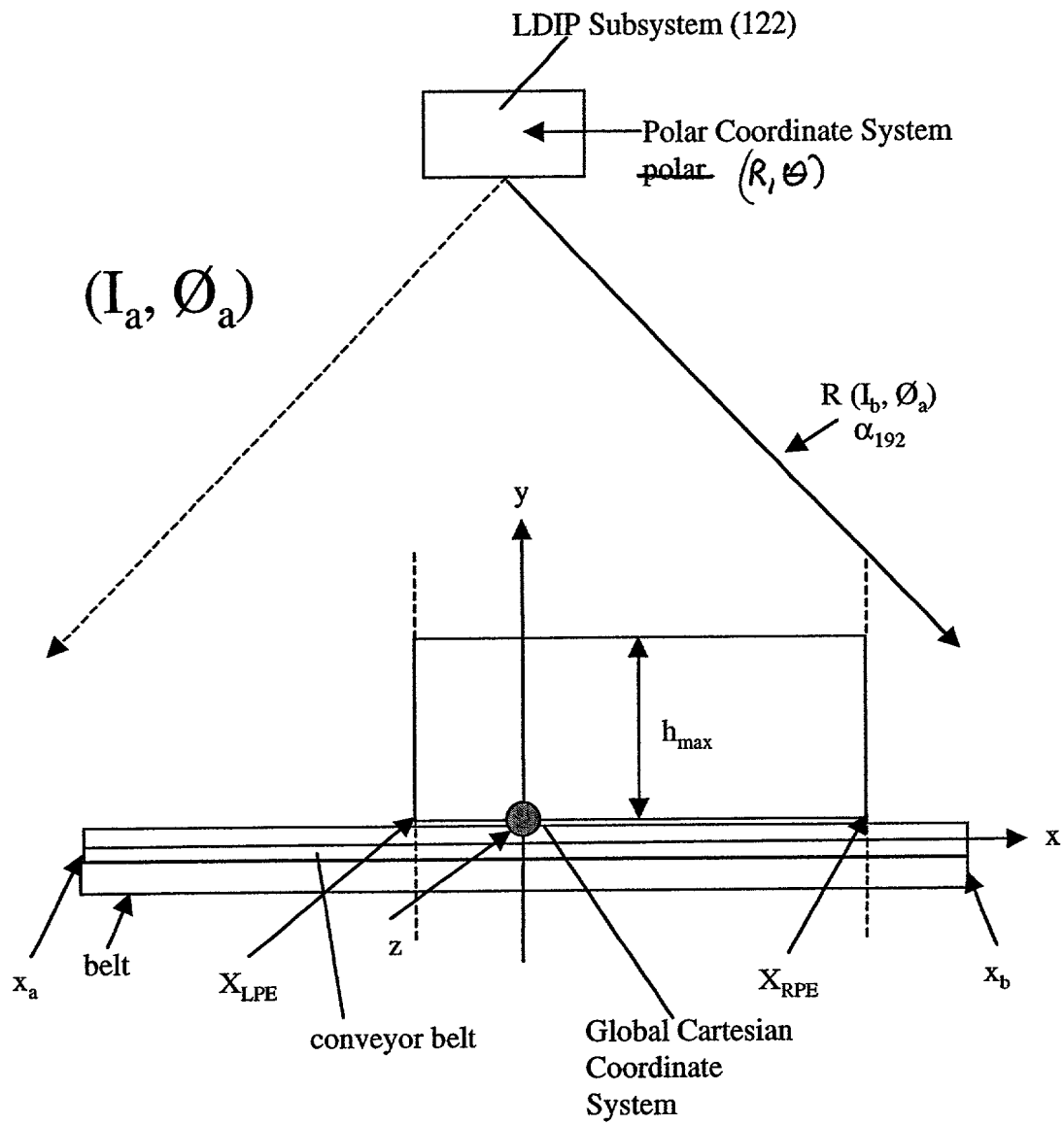


Fig. 17

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INFORMATION MEASURED AT SCAN ANGLES BEFORE COORDINATE TRANSFORMS

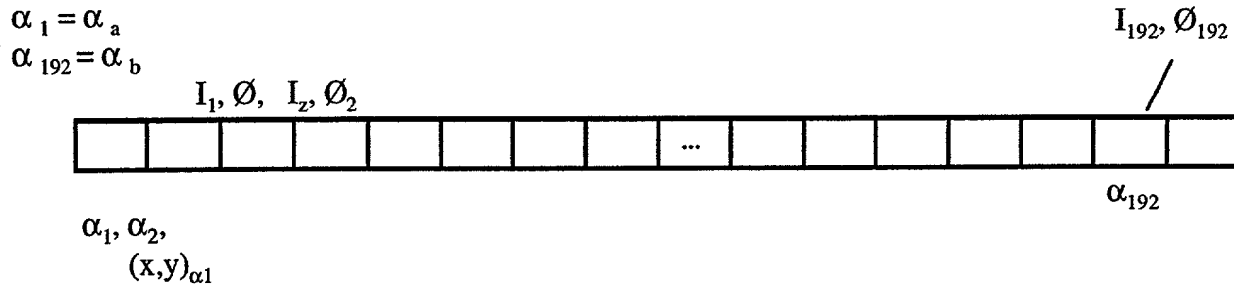


Fig. 17A

RANGE AND POLAR ANGLE MEASURES TAKEN AT SCAN ANGLE α BEFORE COORDINATE TRANSFORMS

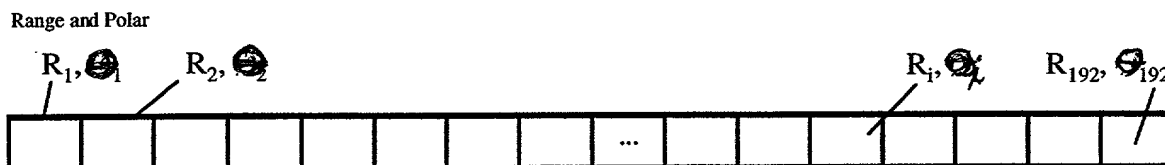


Fig. 17B

MEASURED PACKAGE HEIGHT AND POSITION VALUES AFTER COORDINATE TRANSFORMS

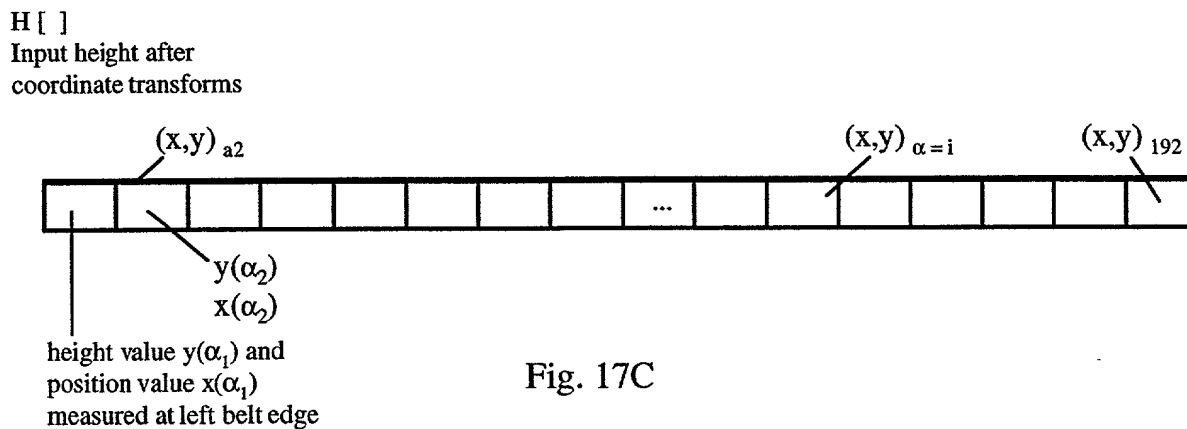


Fig. 17C

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CAMERA CONTROL PROCESS CARRIED OUT WITHIN THE CAMERA CONTROL SUBSYSTEM OF EACH OBJECT ATTRIBUTE ACQUISITION AND ANALYSIS SYSTEM

560

Start

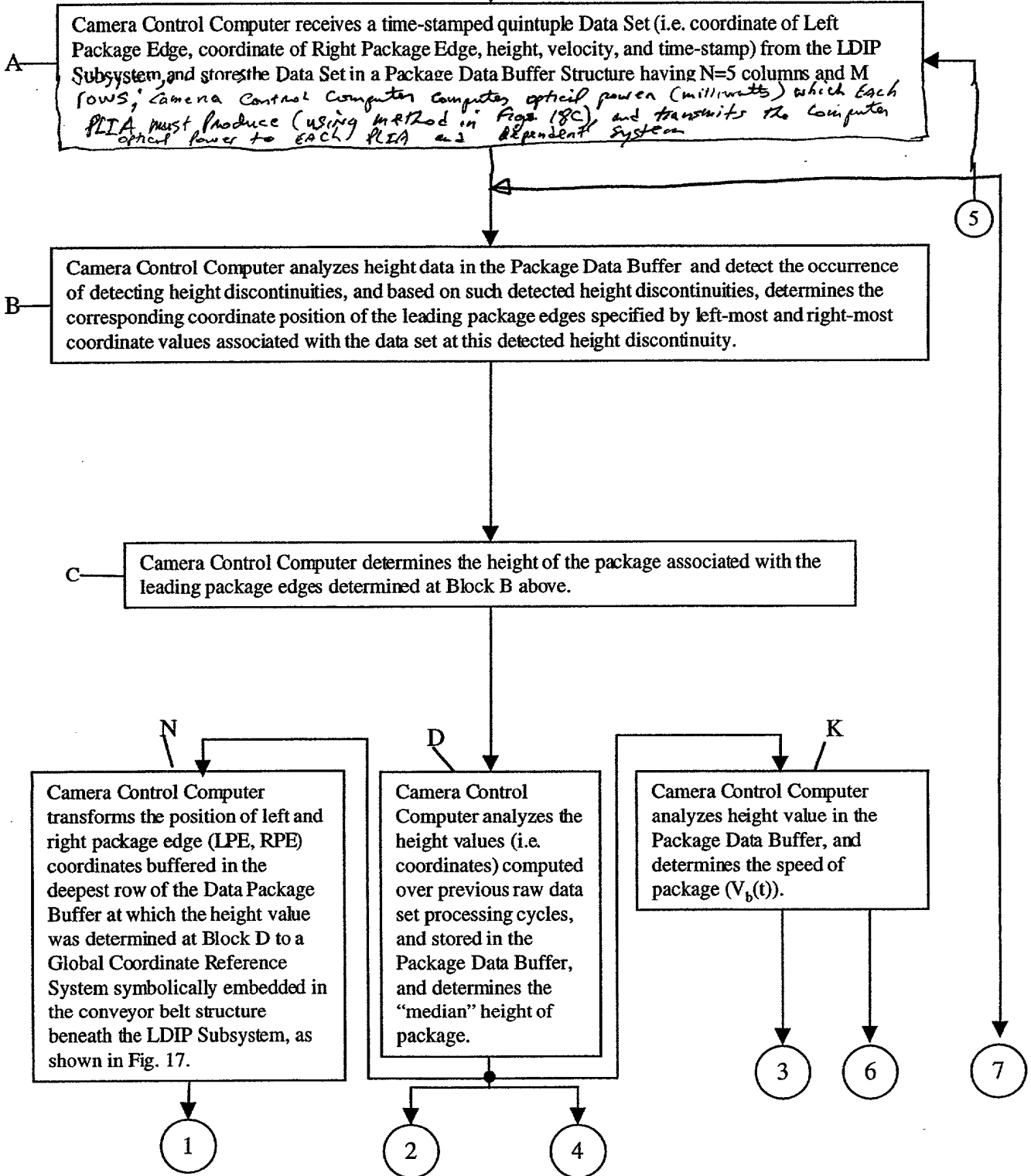


Fig. 18A

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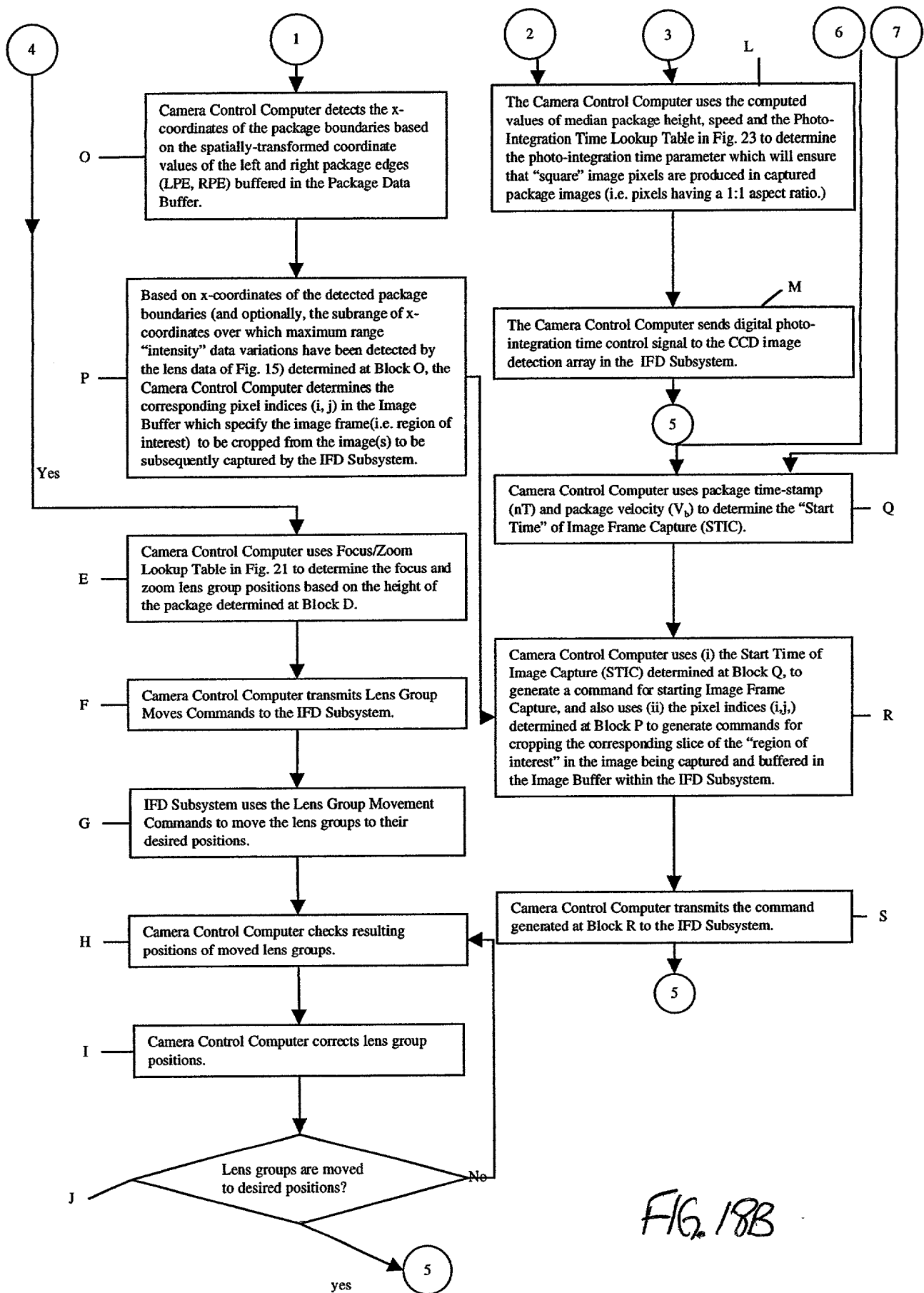


FIG. 18B

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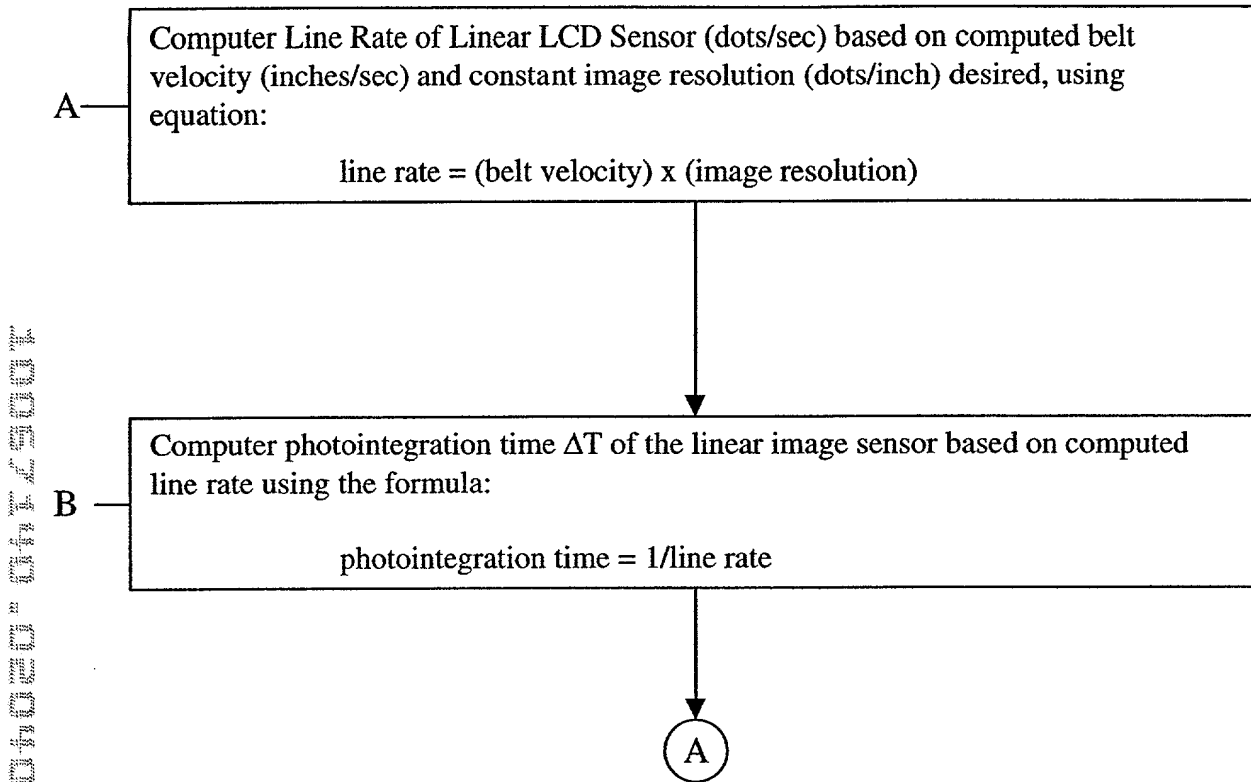


Fig. 18C1

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Compute optical power (milliwatts) of each PLIA based on computed photointegration time (ΔT) using the following formula:

$$\text{optical power of LD (milliwatts)} = \frac{\text{constant}}{\text{photointegration time } \Delta T}$$

Fig. 18C2

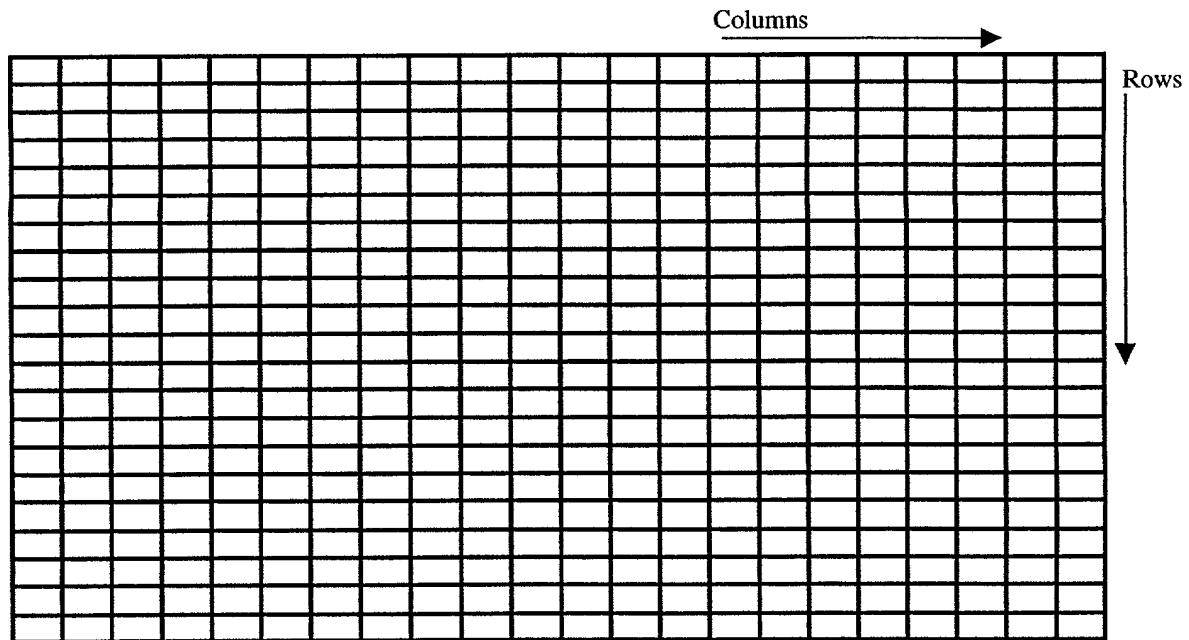
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X coordinate subrange where
maximum range "intensity"
variations have been detected

Left Package Edge (LDE)	Package Height (h)	Right Package Edge (RPE)	Package Velocity	Time-stamp (nT)	
					Row 1
					Row 2
					Row 3
					Row 4
					Row 5
					Row M

Package Data Buffer (FIFO)

Fig. 19



Camera Pixel Data Buffer
pixel indices (i,j)

Fig. 20

Zoom and Focus Lens Group position Look-up Table

Distance from Camera H (mm)	Zoom group distance (mm) Y (Zoom)	Focus group distance (mm) Y (Focus)
1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 (use interpolation techniques for working distances between listed points in table)	21.57489228 19.38089696 17.10673434 14.77137314 12.39153565 9.979114358 7.540639114 5.078794775 2.595989366 0.099972739	2.47E-05 10.99009783 20.65783177 29.10917002 36.47312595 42.87845436 48.44003358 53.25495831 57.40834303 60.98883615

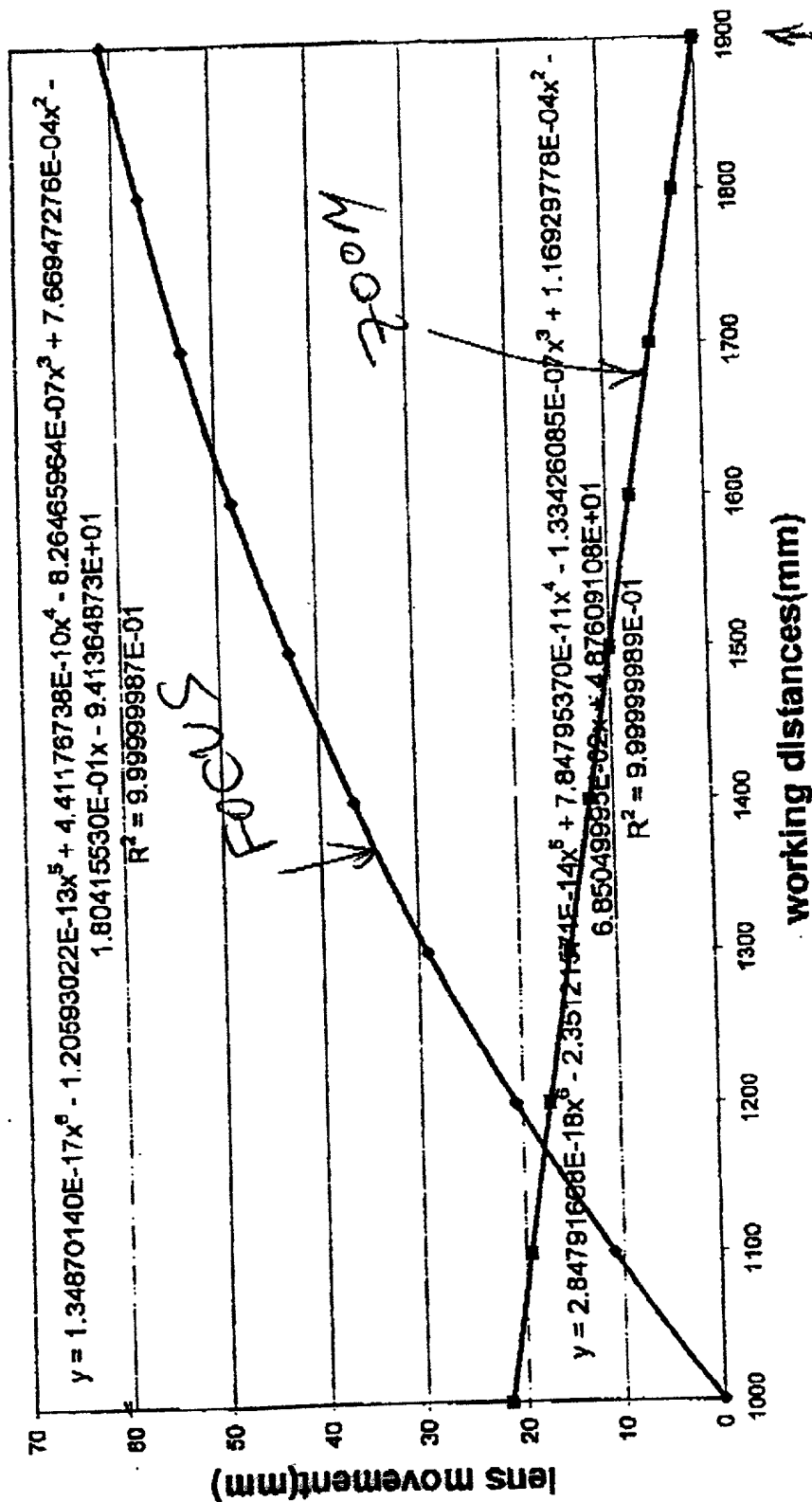
FIG. 21

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2010020-0117-0001

* Note: On focal distance & zoom (eff. focal length) in camera lens are coupled (inter-dependent) in camera has a fixed aperture F5.6

Focus and Zoom lens movement vs. working distances



—•— zoom 1 —•— zoom 2 —•— Poly. (zoom 1) —•— Poly. (zoom 2)

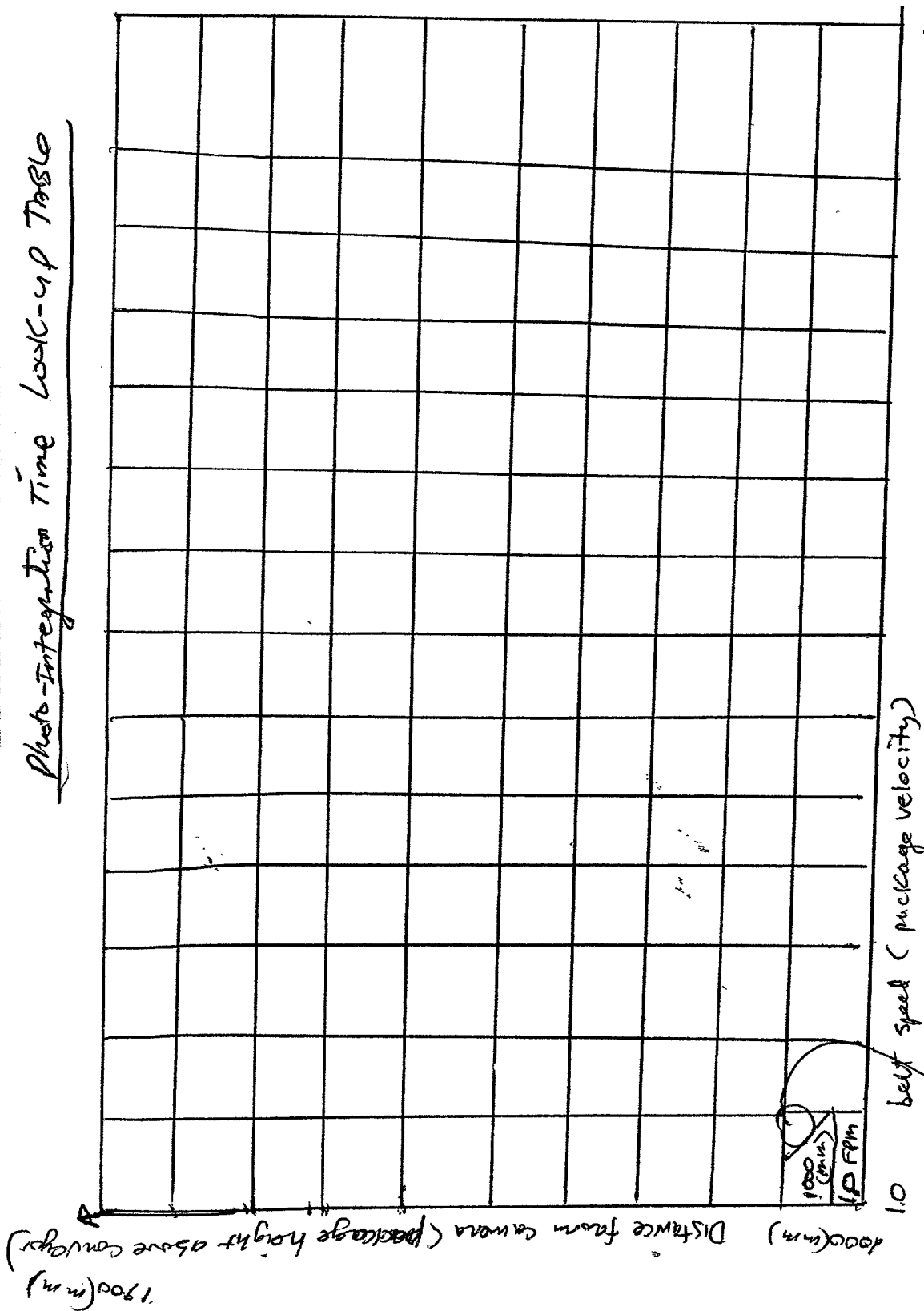
↑ (inches) 40 above conveyor belt
 ← package height above conveyor surface
 conveyor-belt surface

FIG. 22

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width of 500 ft

Photo-Integration Time Look-up Table



600 feet per minute
(FPM)

FIG. 23

Photo-Integration
Time Value That
Ensures Square Image Pixels
(1:1 aspect ratio)

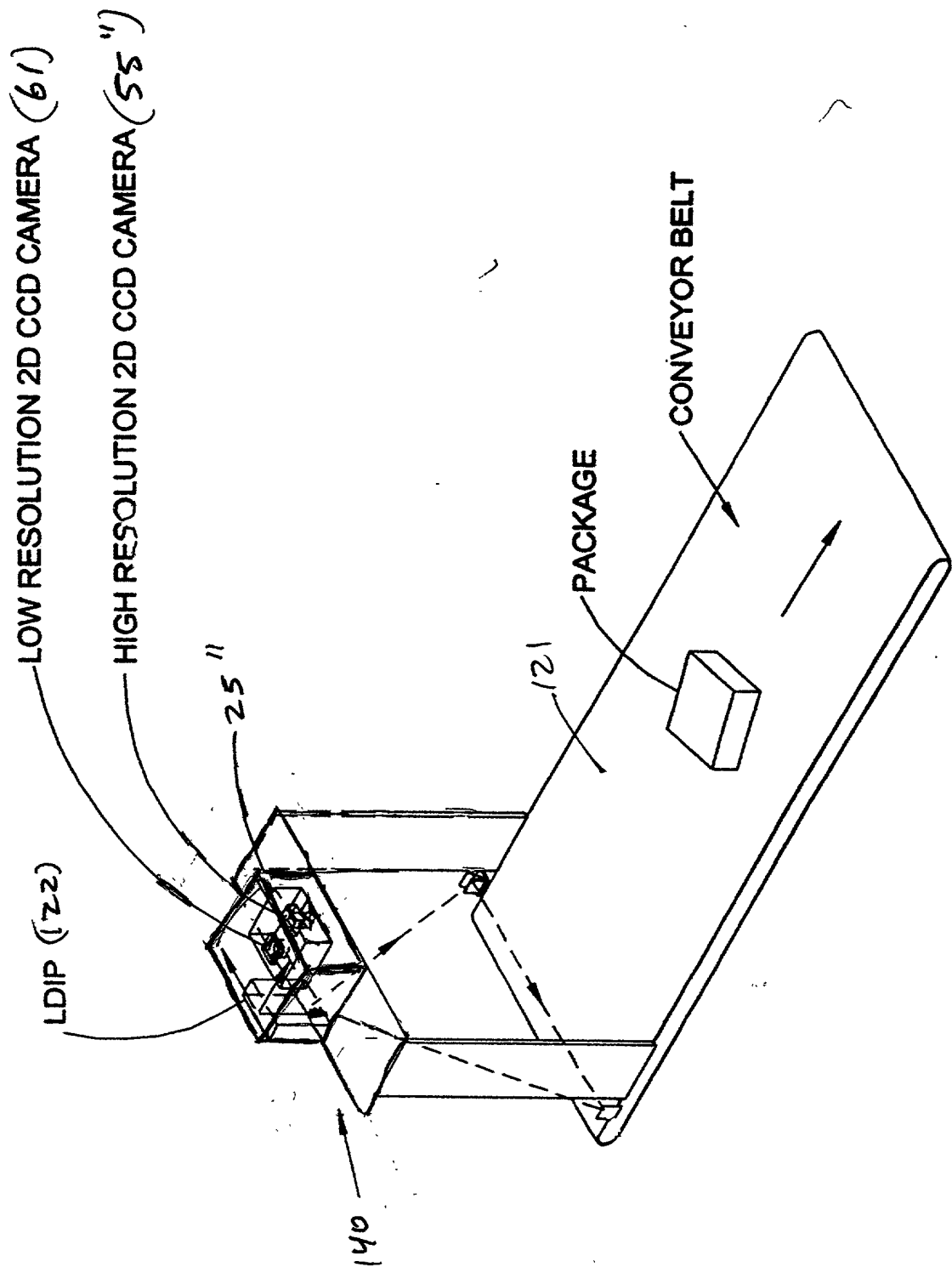


FIG 24

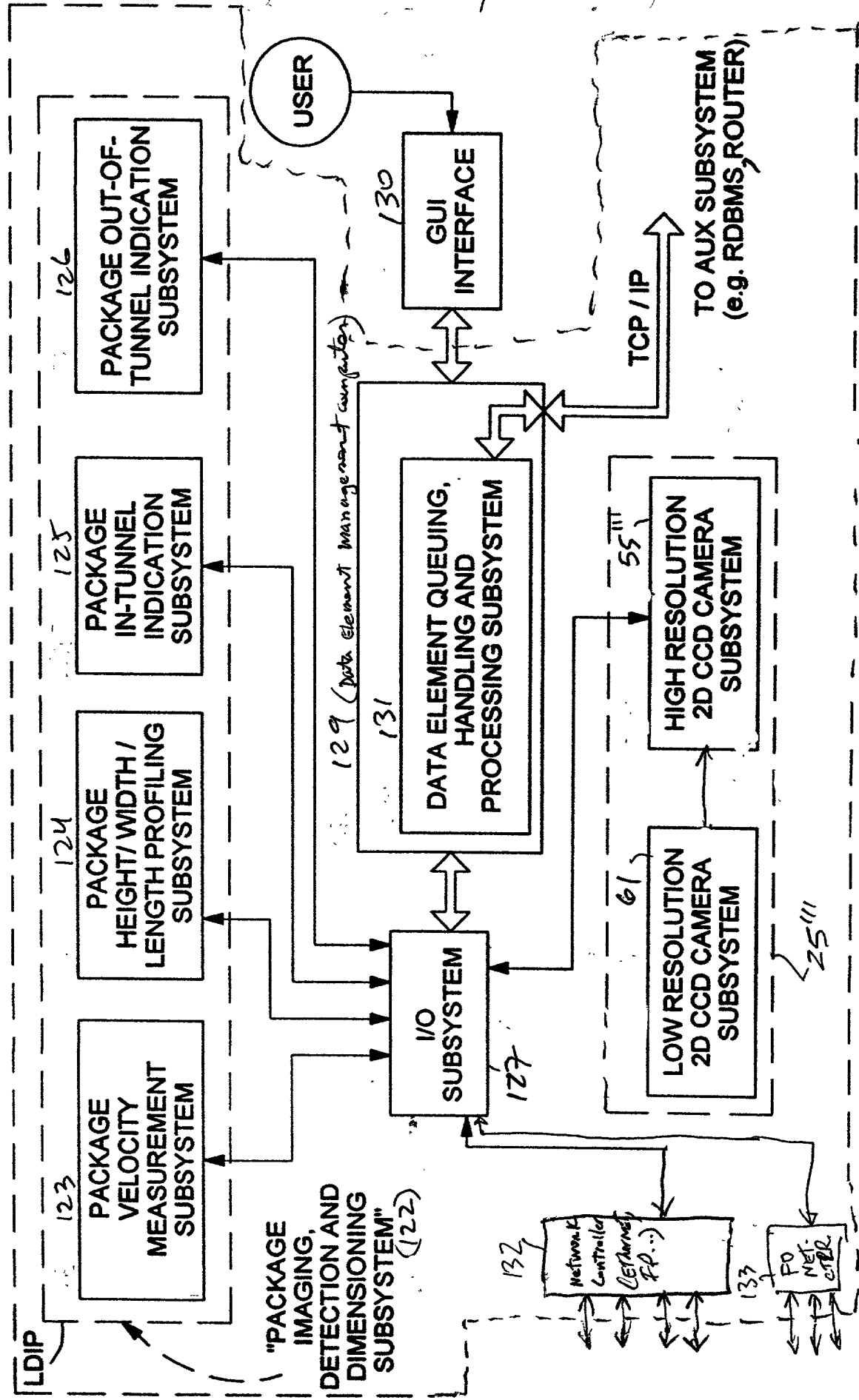


FIG. 25

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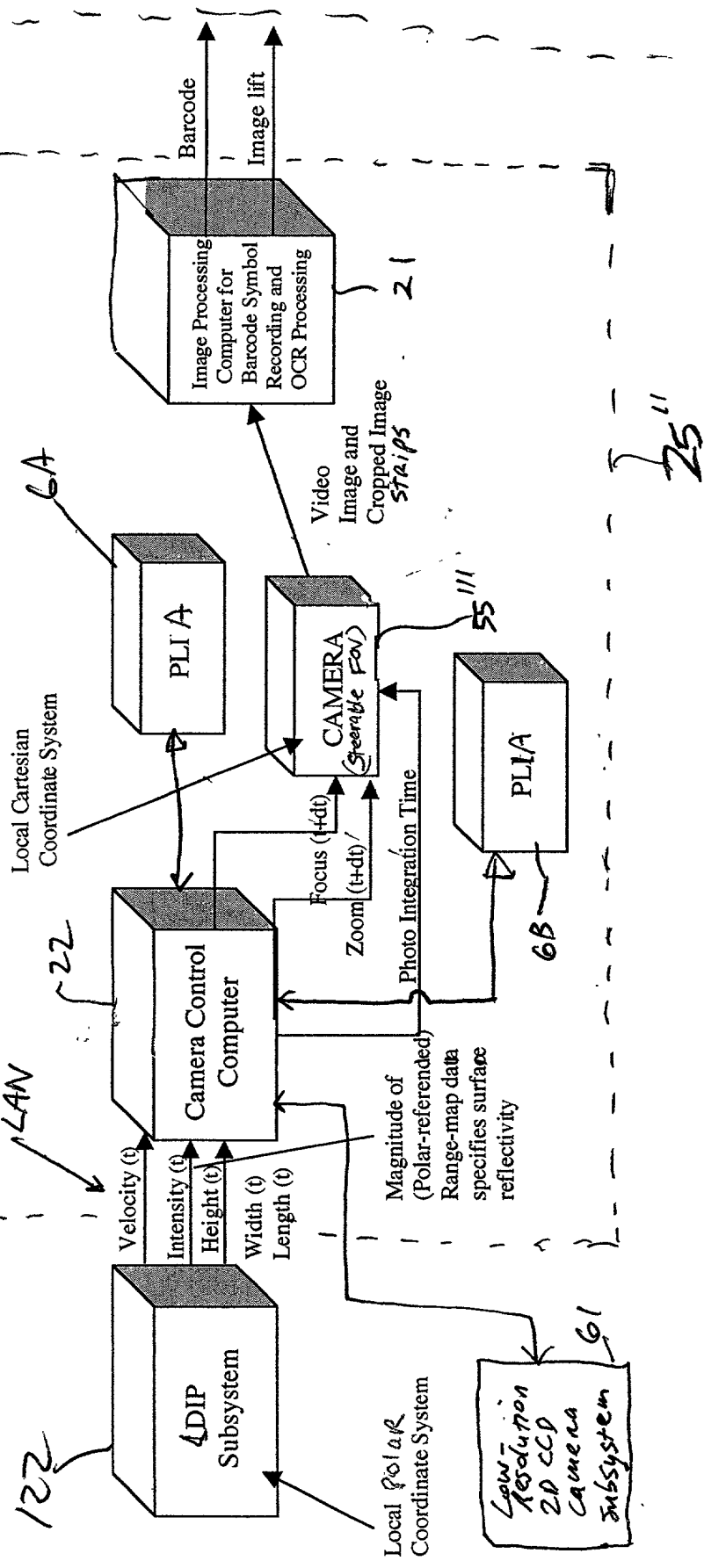
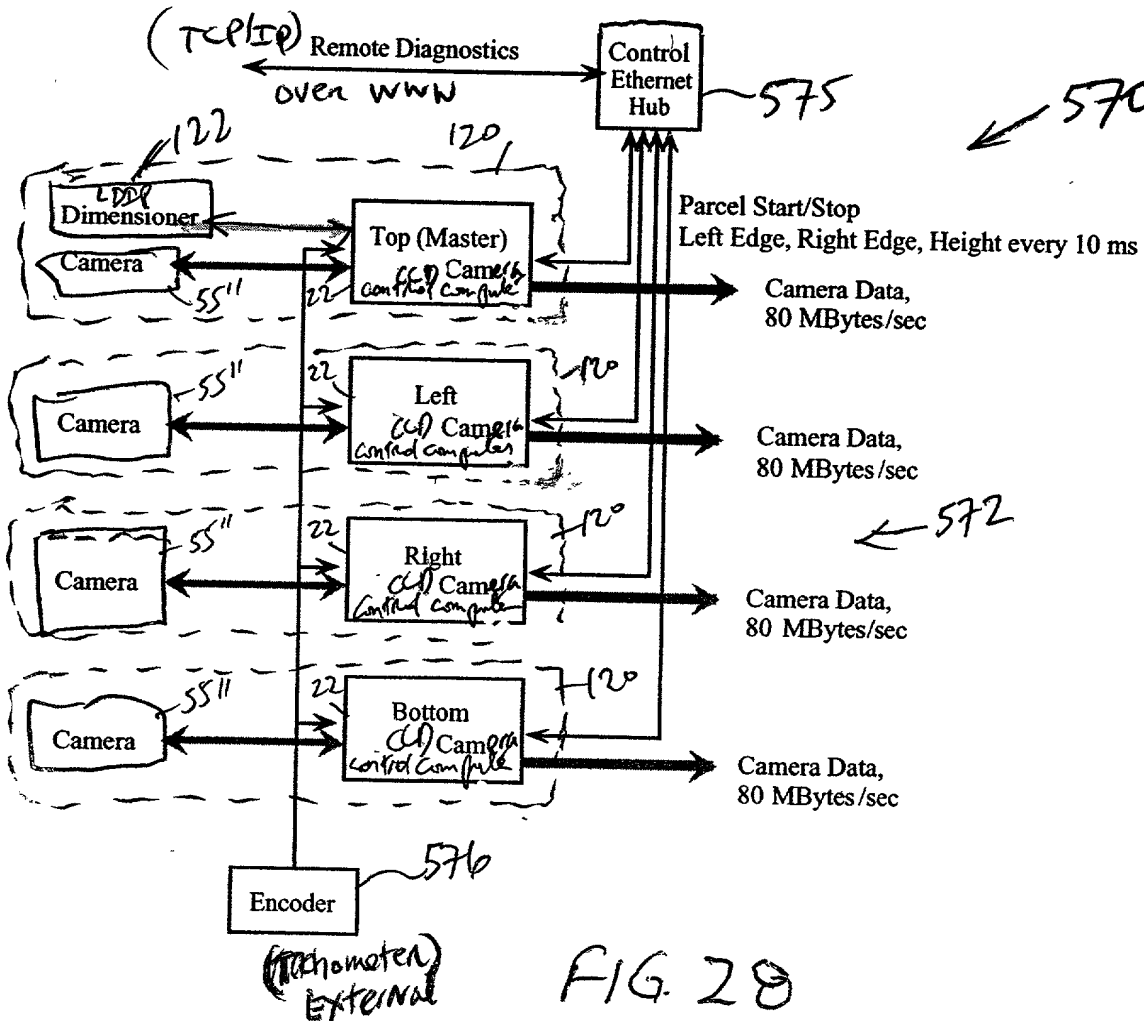
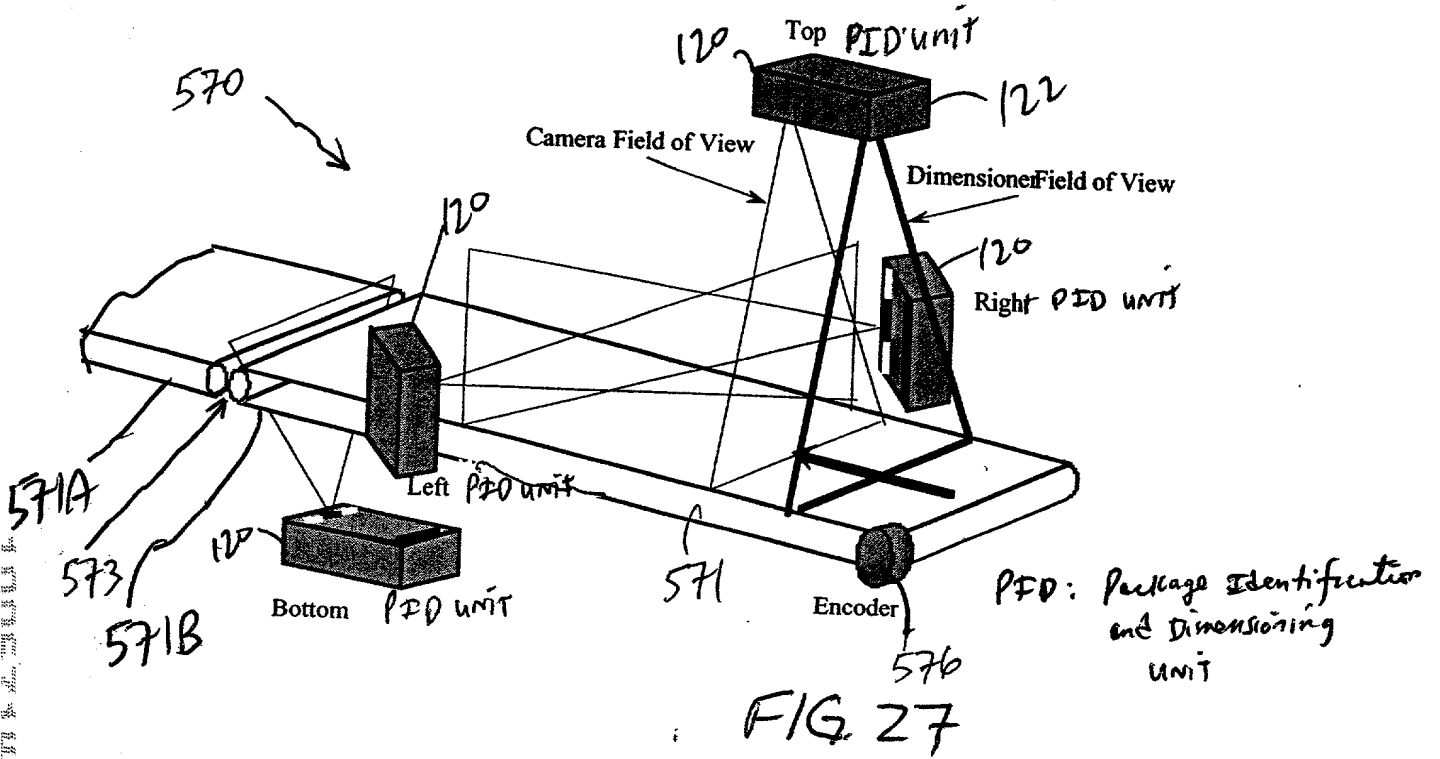


FIG. 26

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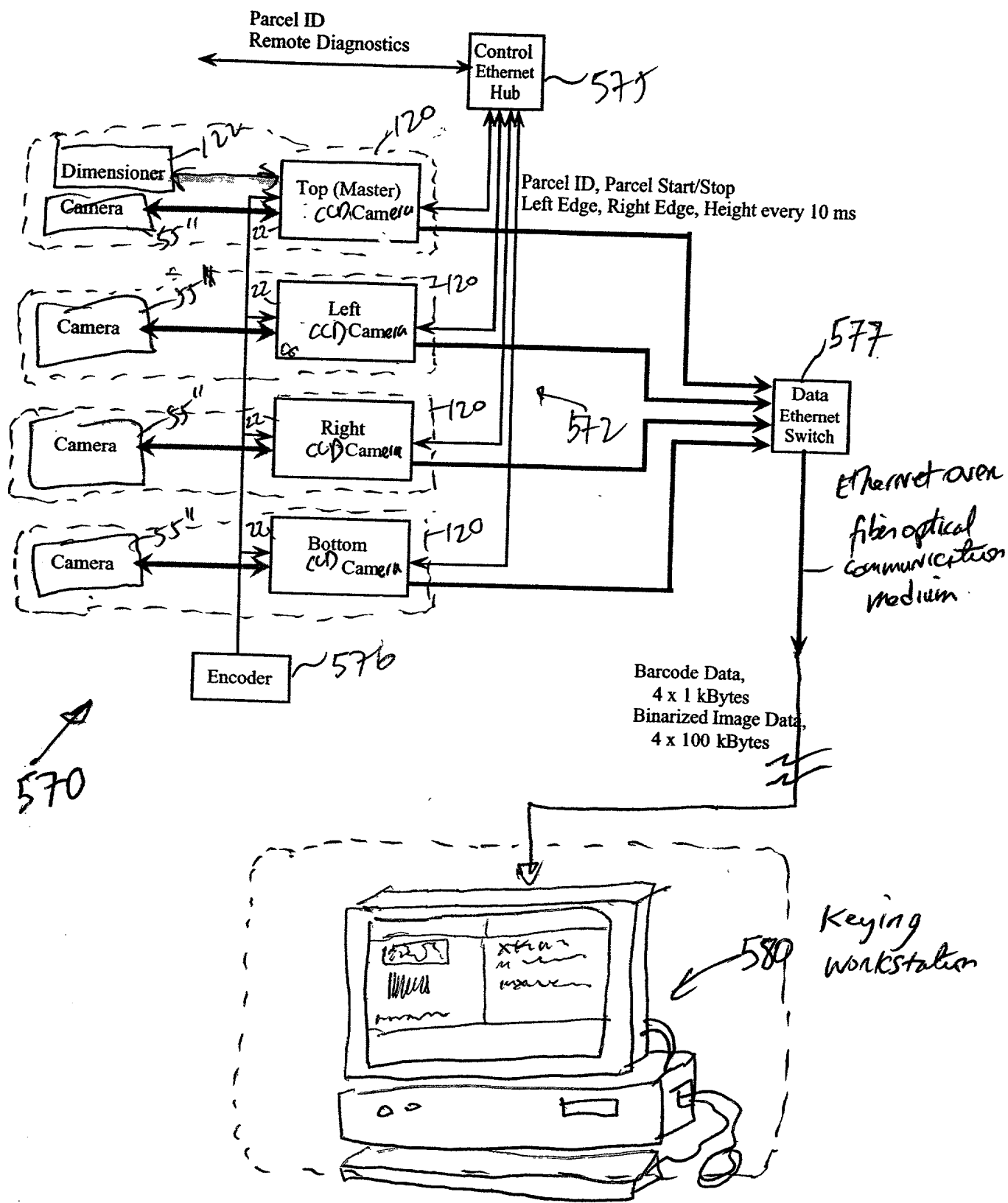
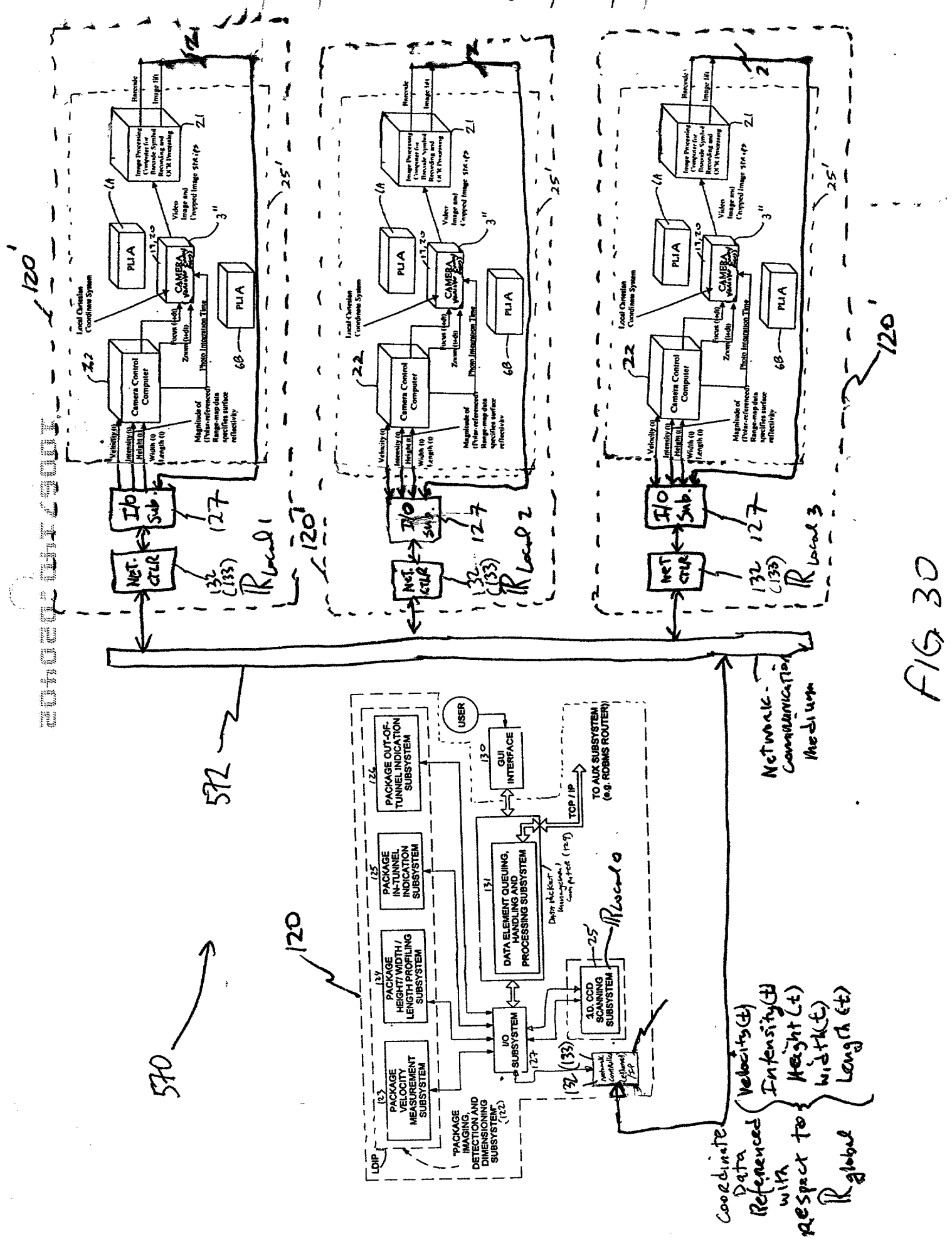


FIG. 29



CCD Camera-Based Tunnel System
Employing Package Coordinate Data
Driven Method of Automatic Camera
Zoom and Focus Control

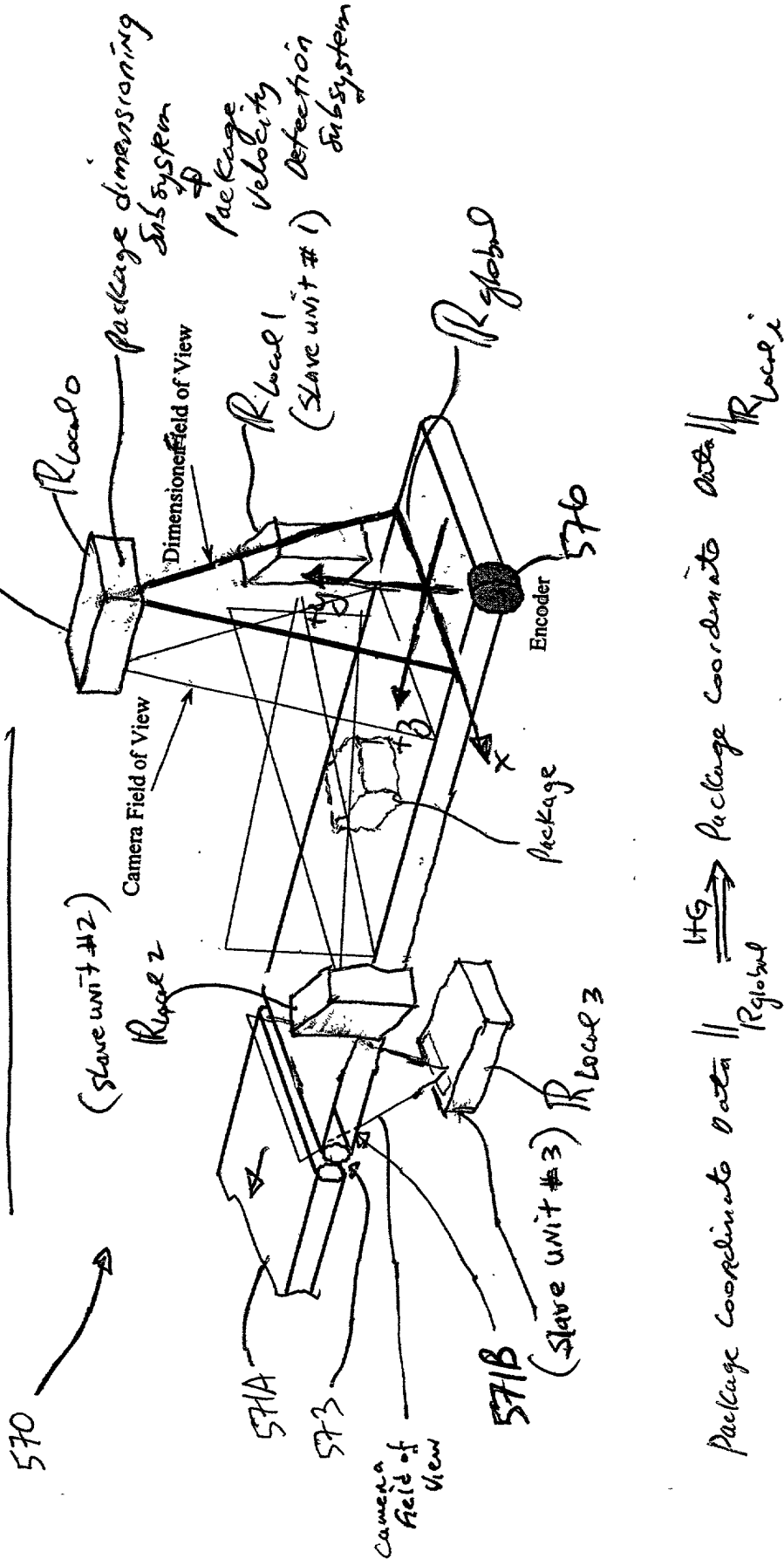


FIG. 31

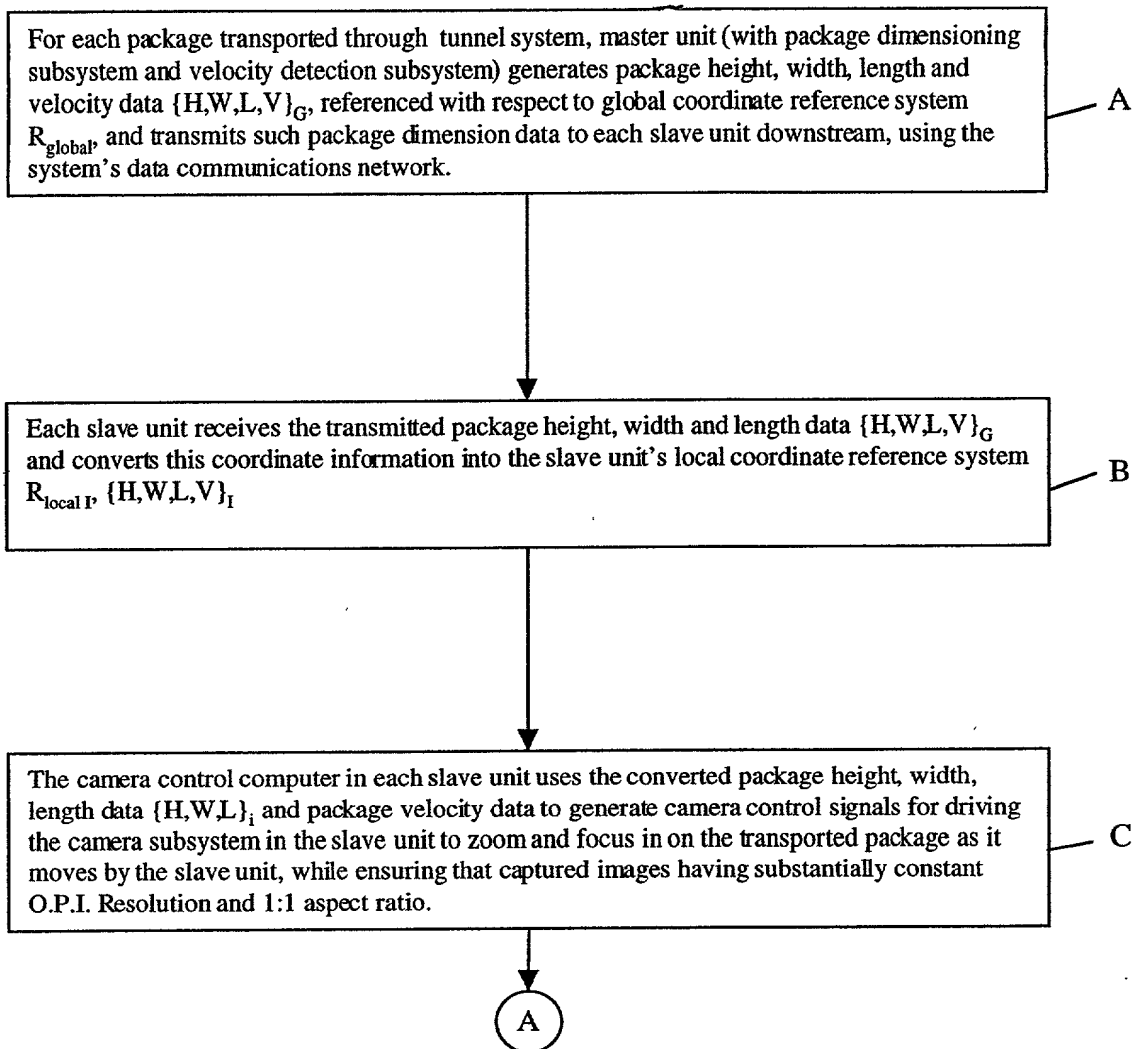


FIG. 32A

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Each slave unit captures images acquired by its intelligently controlled camera subsystem, buffers the same, and processes the images to decode bar code symbol identifiers represented in said images, and/or to perform optical character recognition (OCR) thereupon.

D

The slave unit which decodes a bar code symbol in a processed image automatically transmits a package identification data element (containing symbol character data representative of the decoded bar code symbol) to the master unit (or other designated system control unit employing data element management functionalities) for package data element processing.

E

Master unit time-stamps received package identification data element, places said data element in a data queue, and processes package identification data elements and time-stamped package dimension data elements in said queue to link each package identification data element with one said corresponding package dimension data element.

F

FIG. 32B

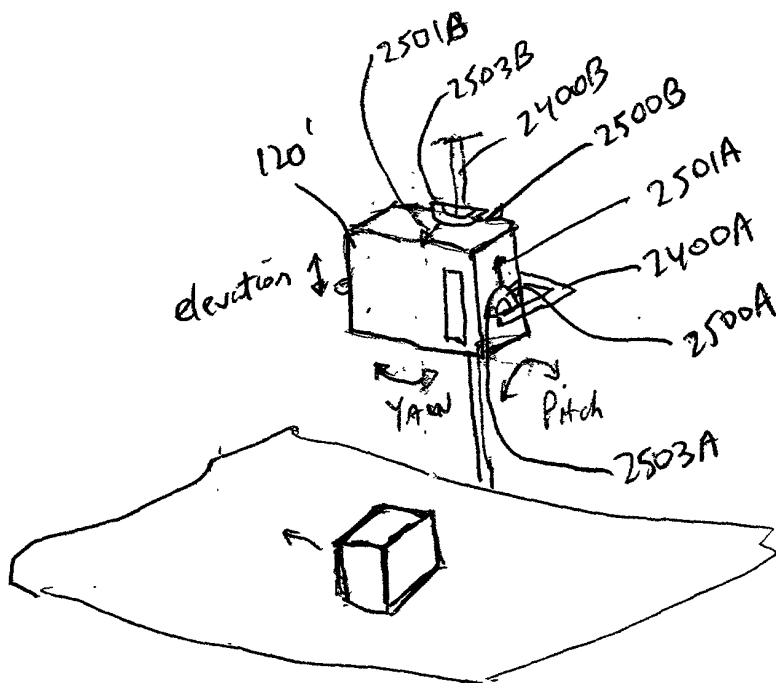


FIG. 31A

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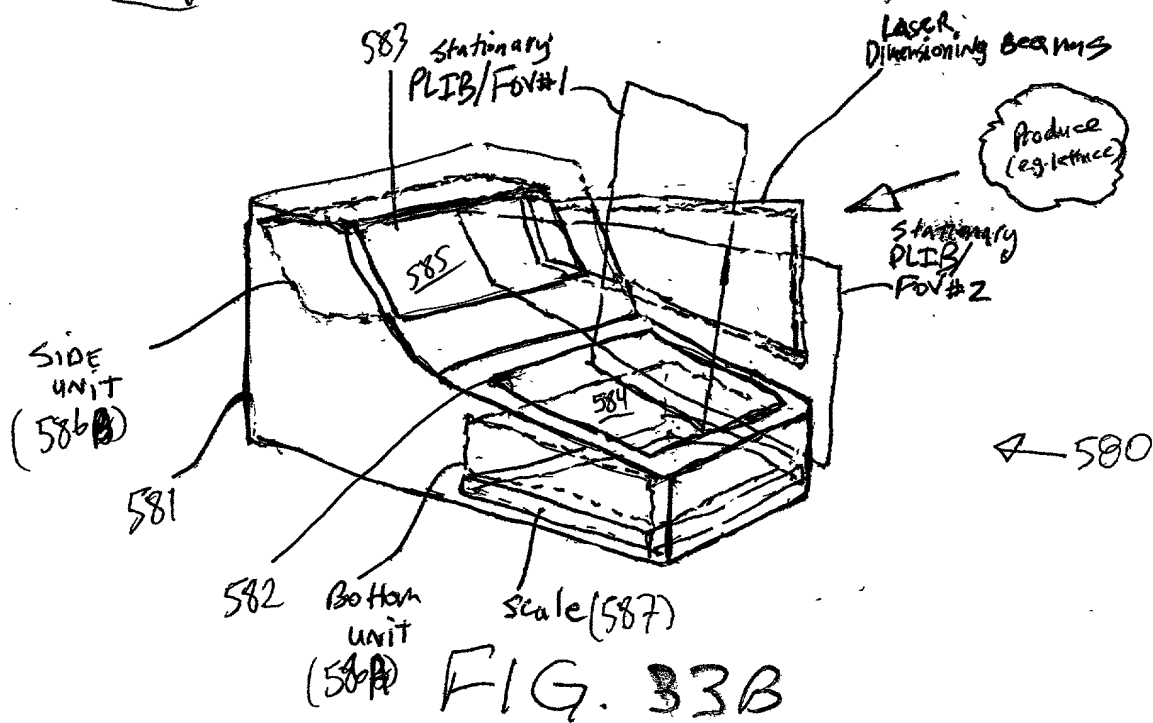
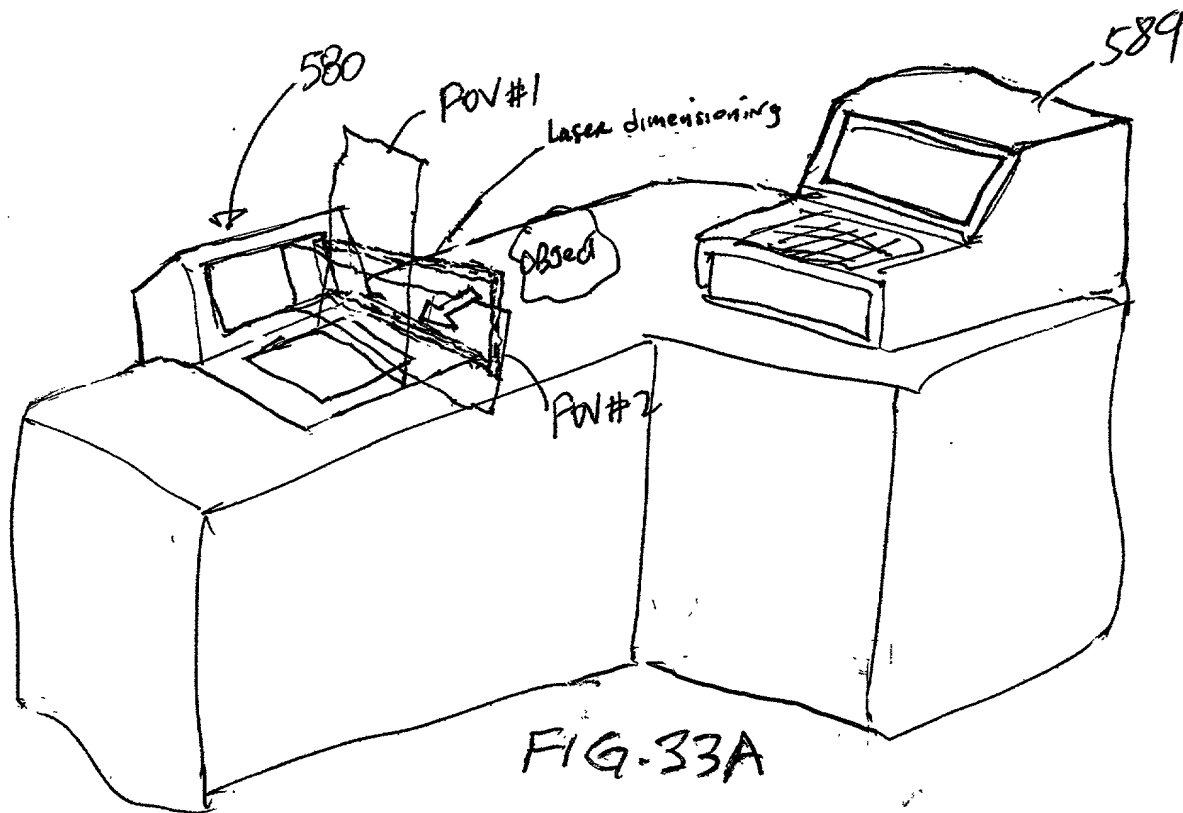




FIG. 33C

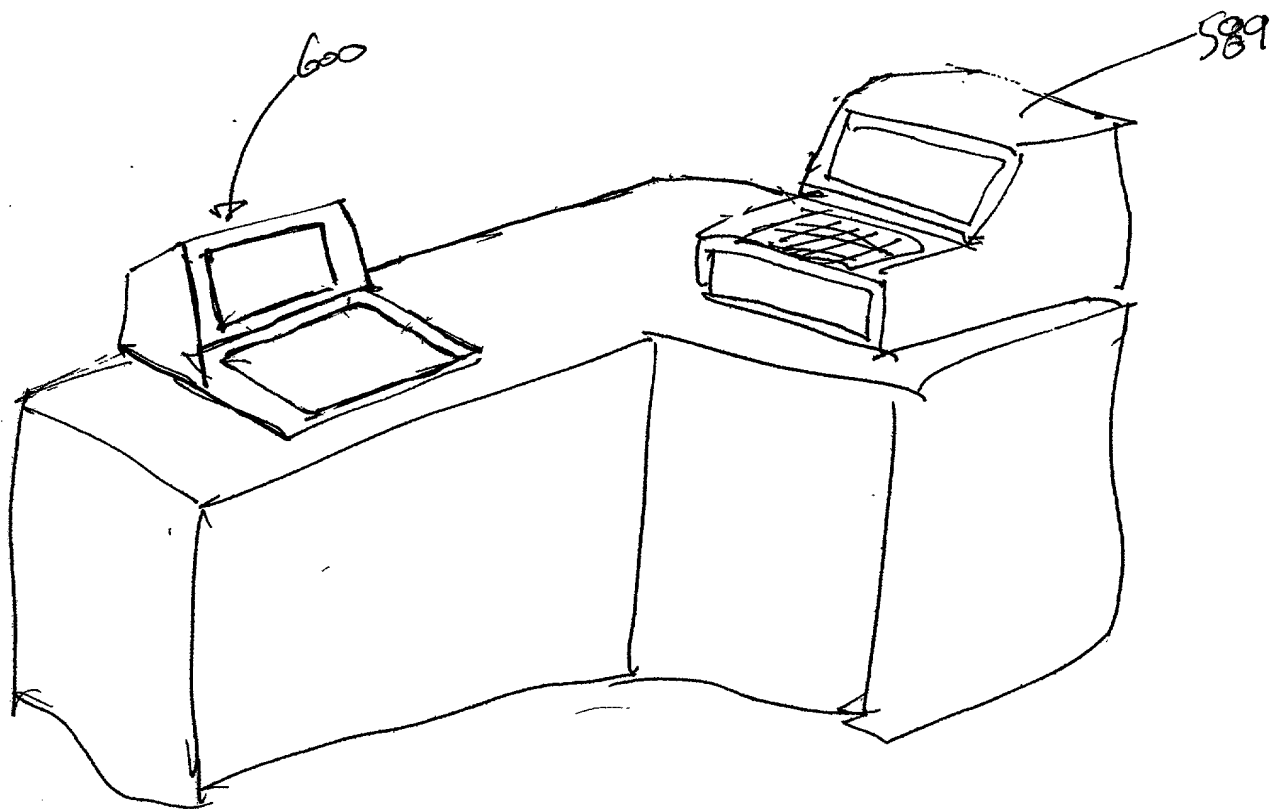


FIG. 34A

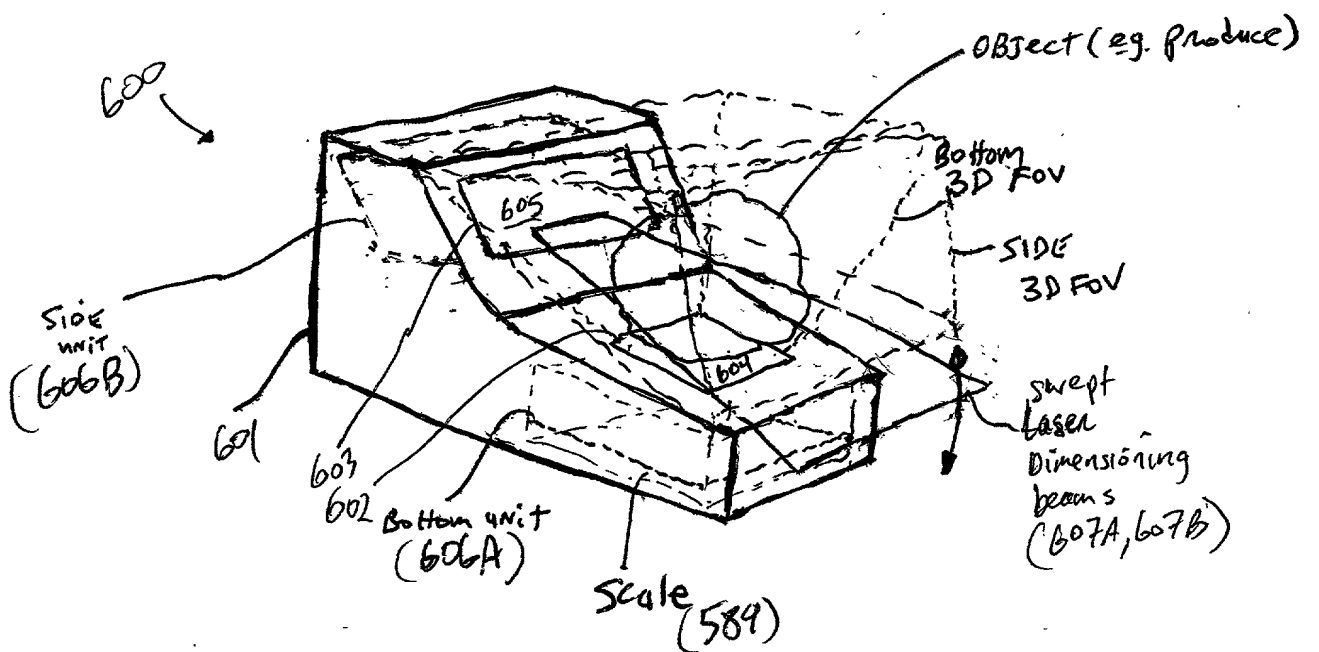


FIG. 34B

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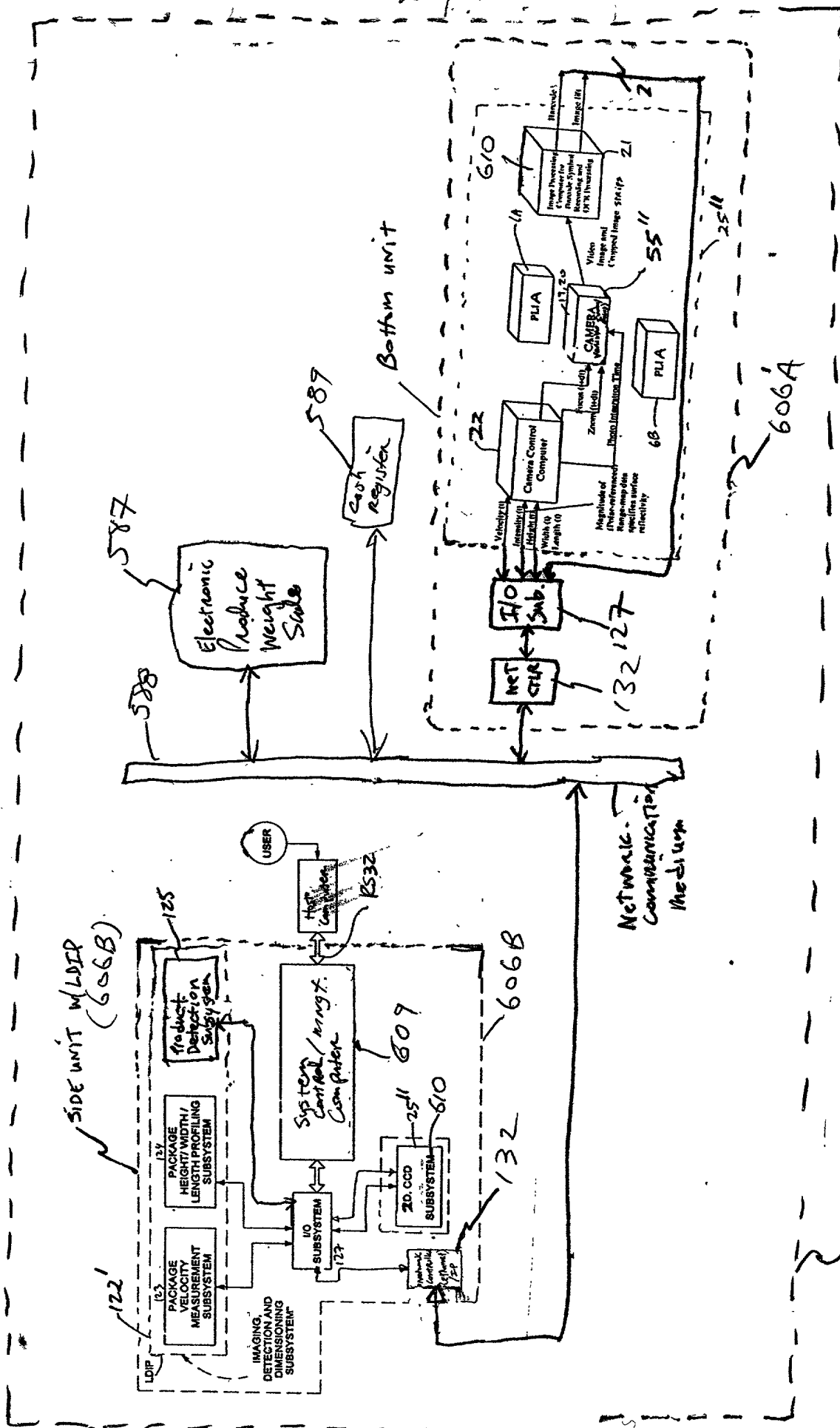
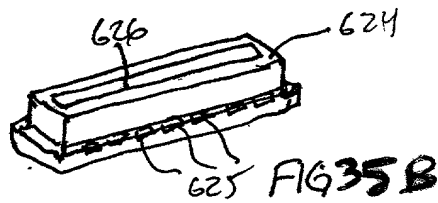
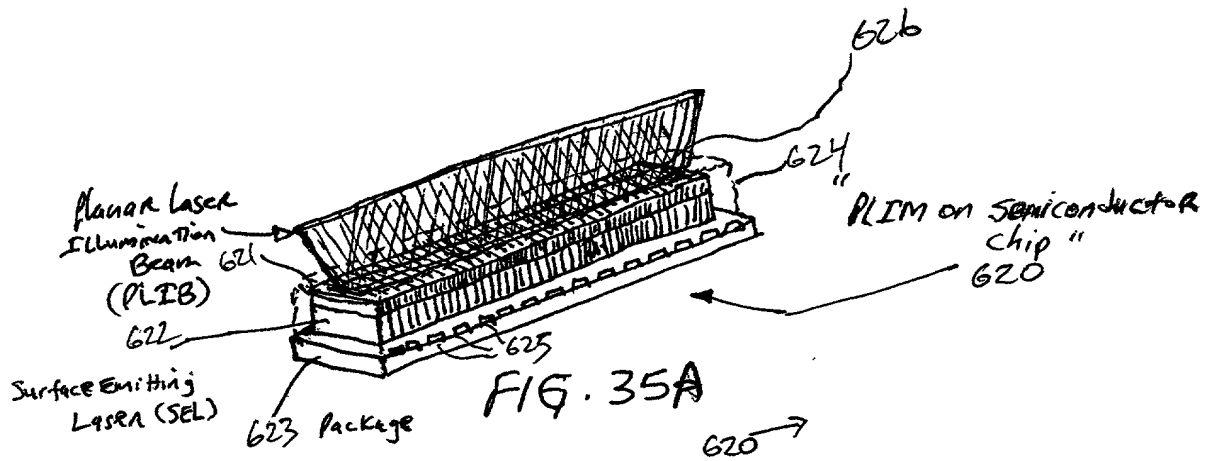
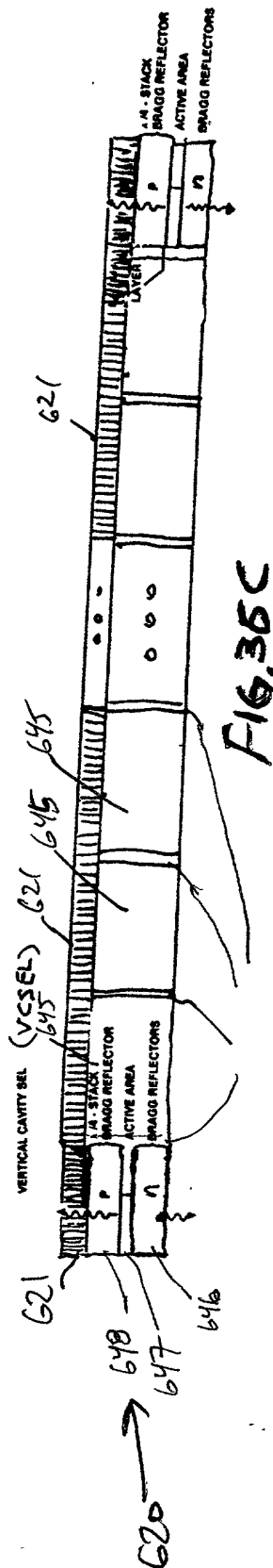


FIG 34C





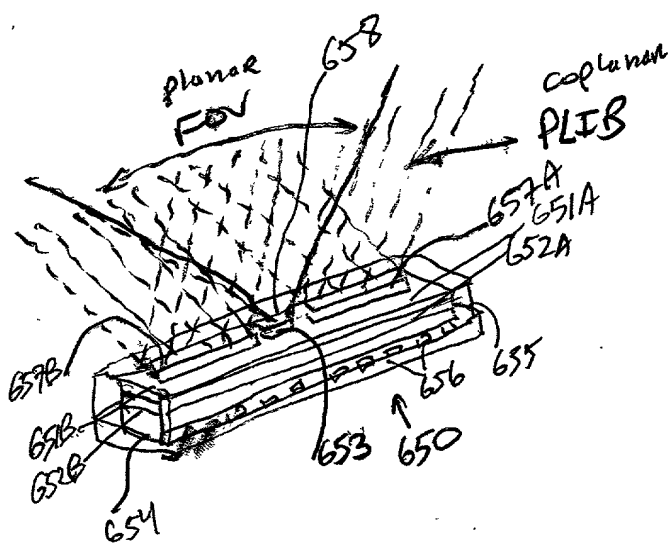


FIG. 37

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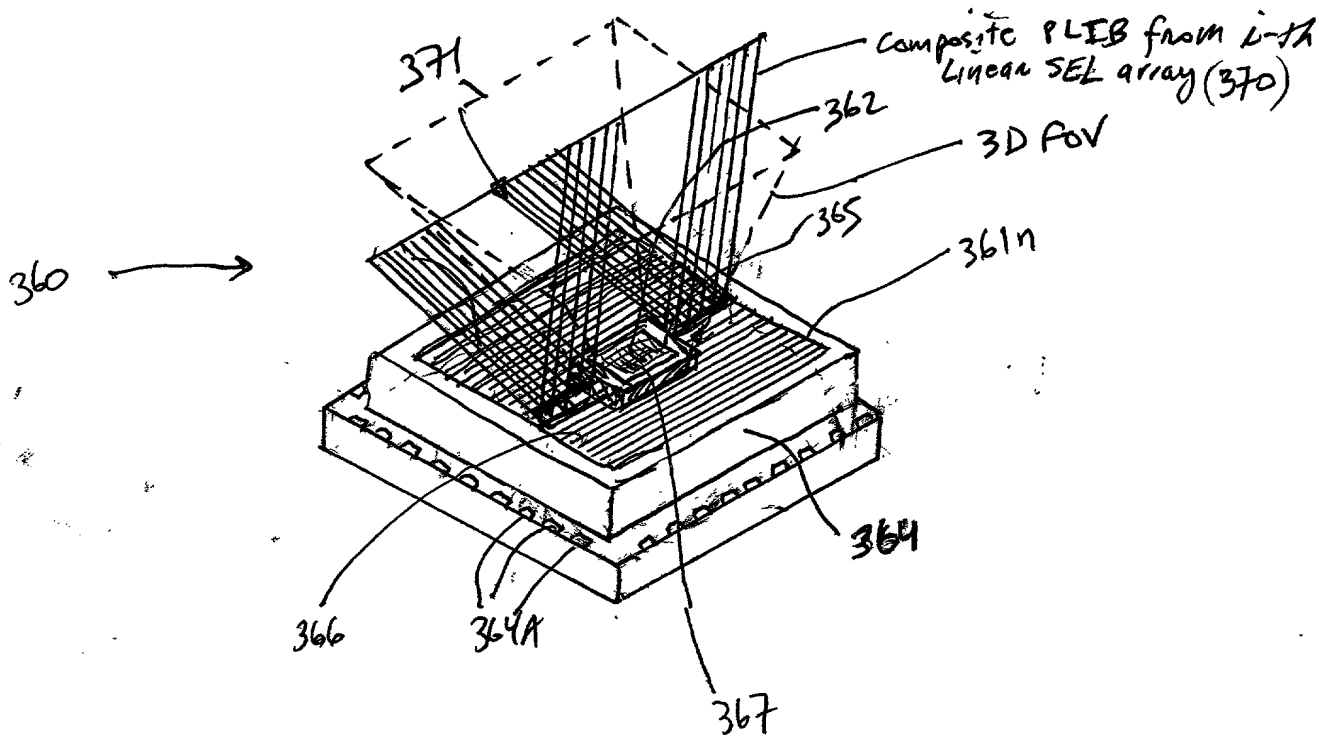


FIG. 38A

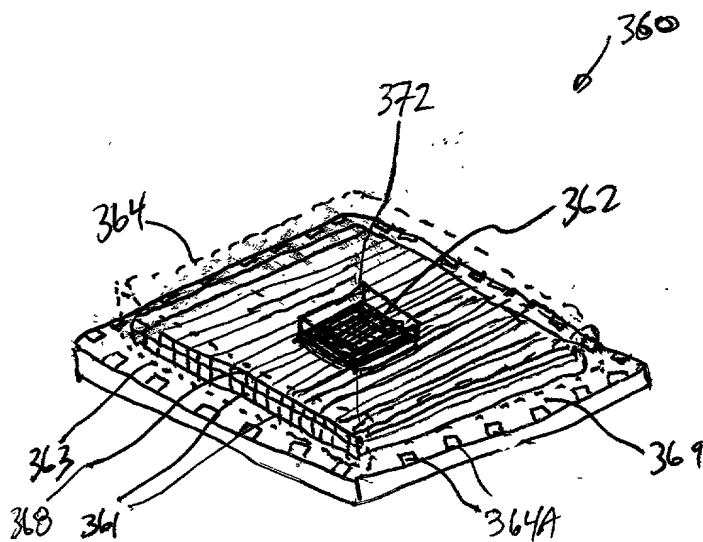
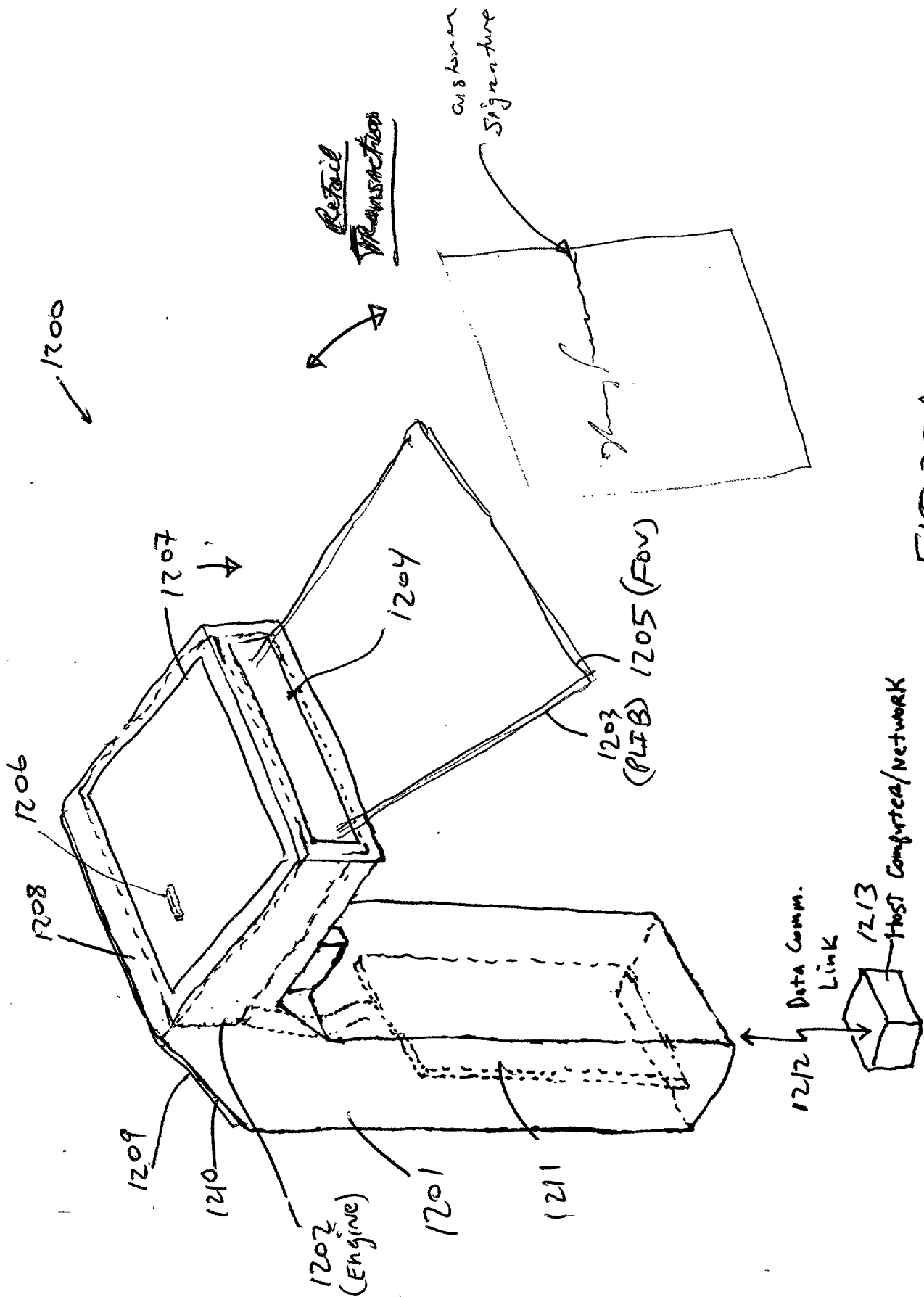


FIG. 38B



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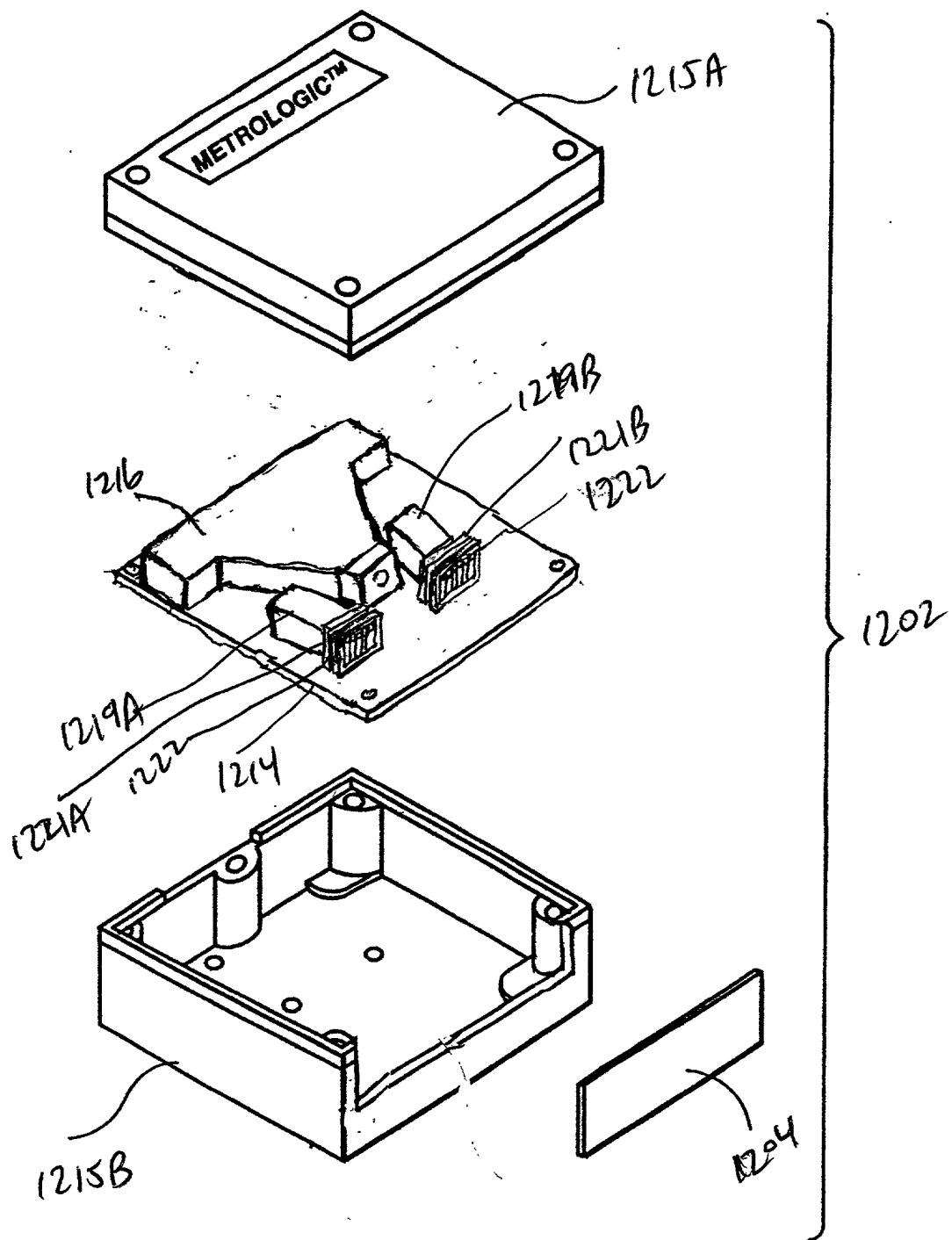
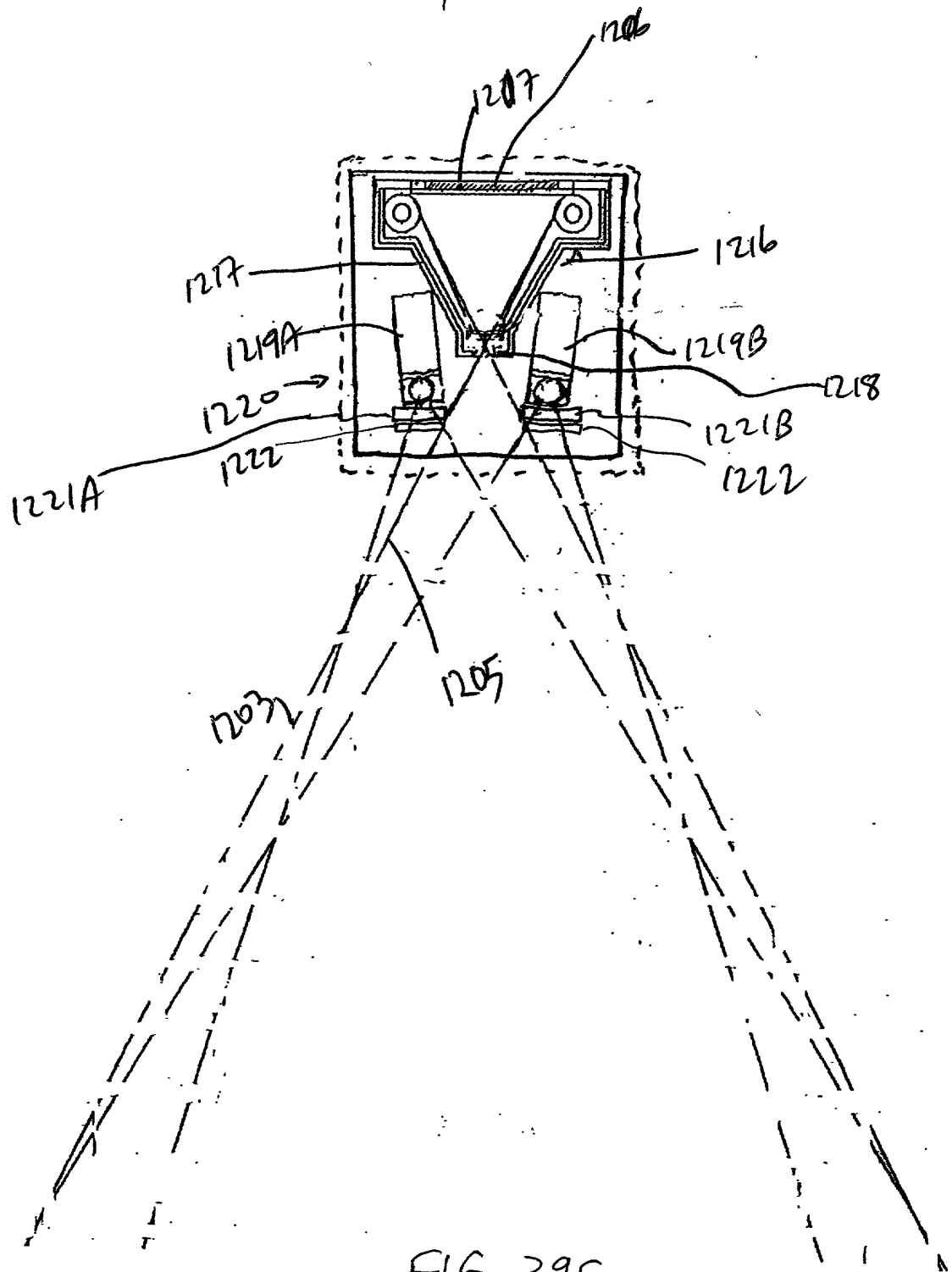


FIG. 39B

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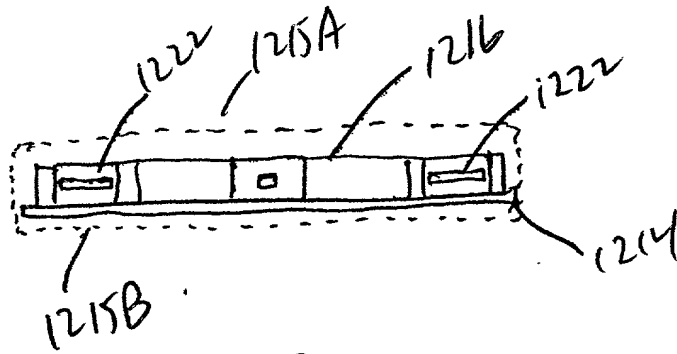


FIG. 39D

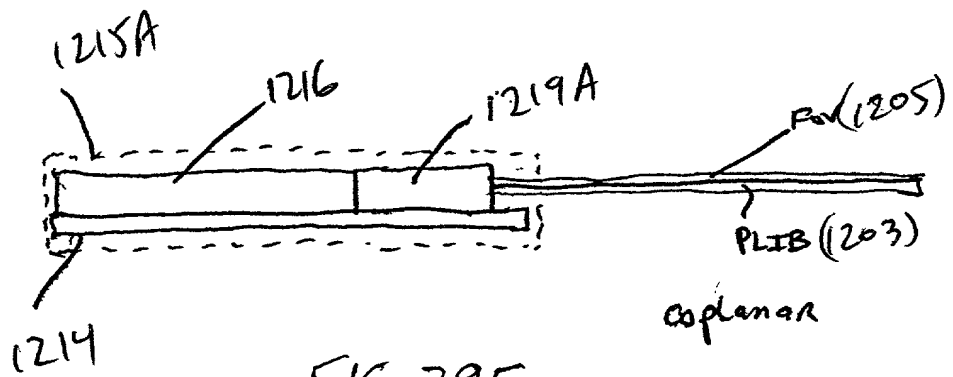


FIG. 39E

20240404

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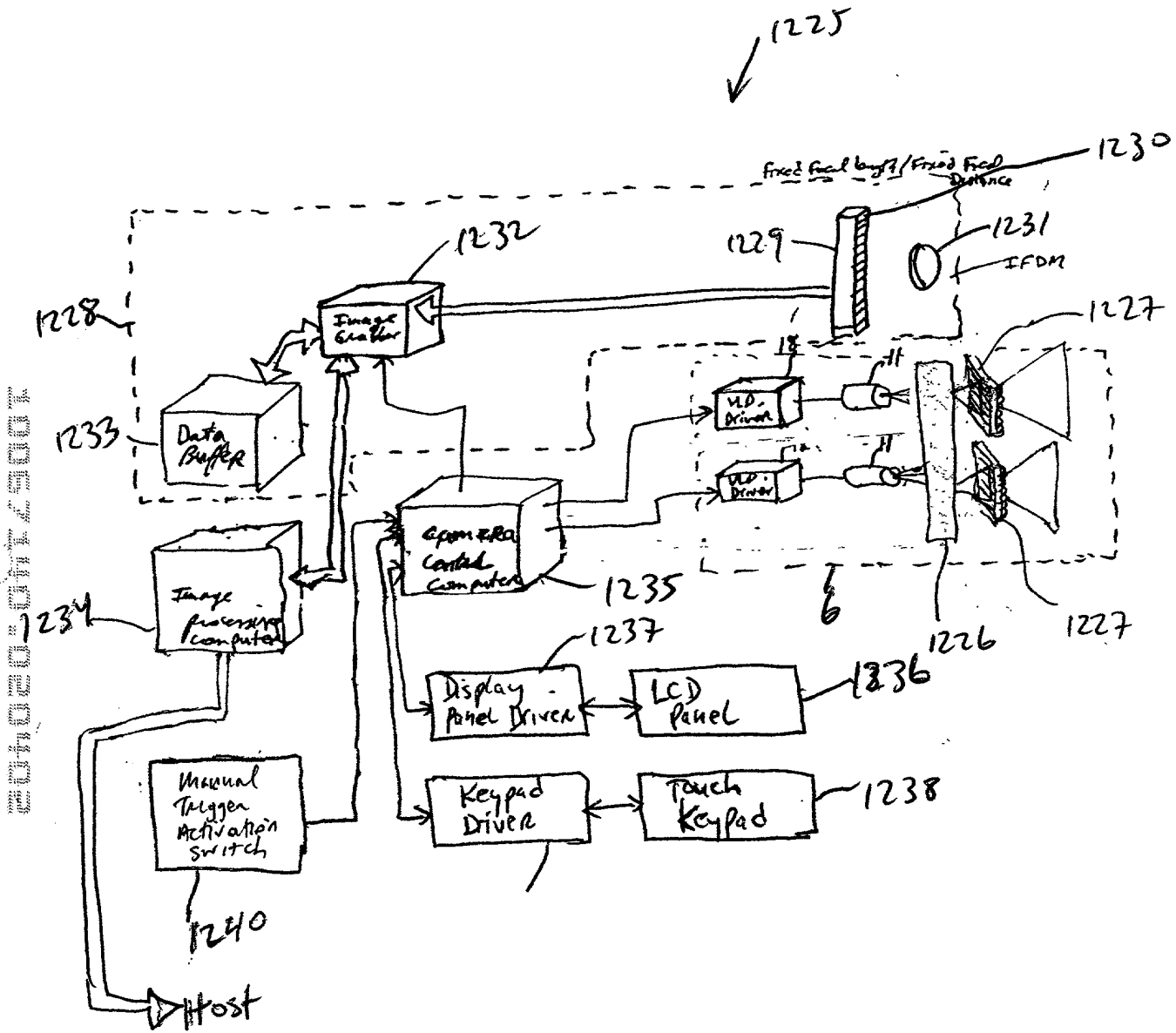
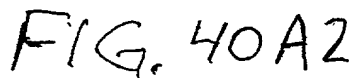


FIG. 40A1

[illegible]

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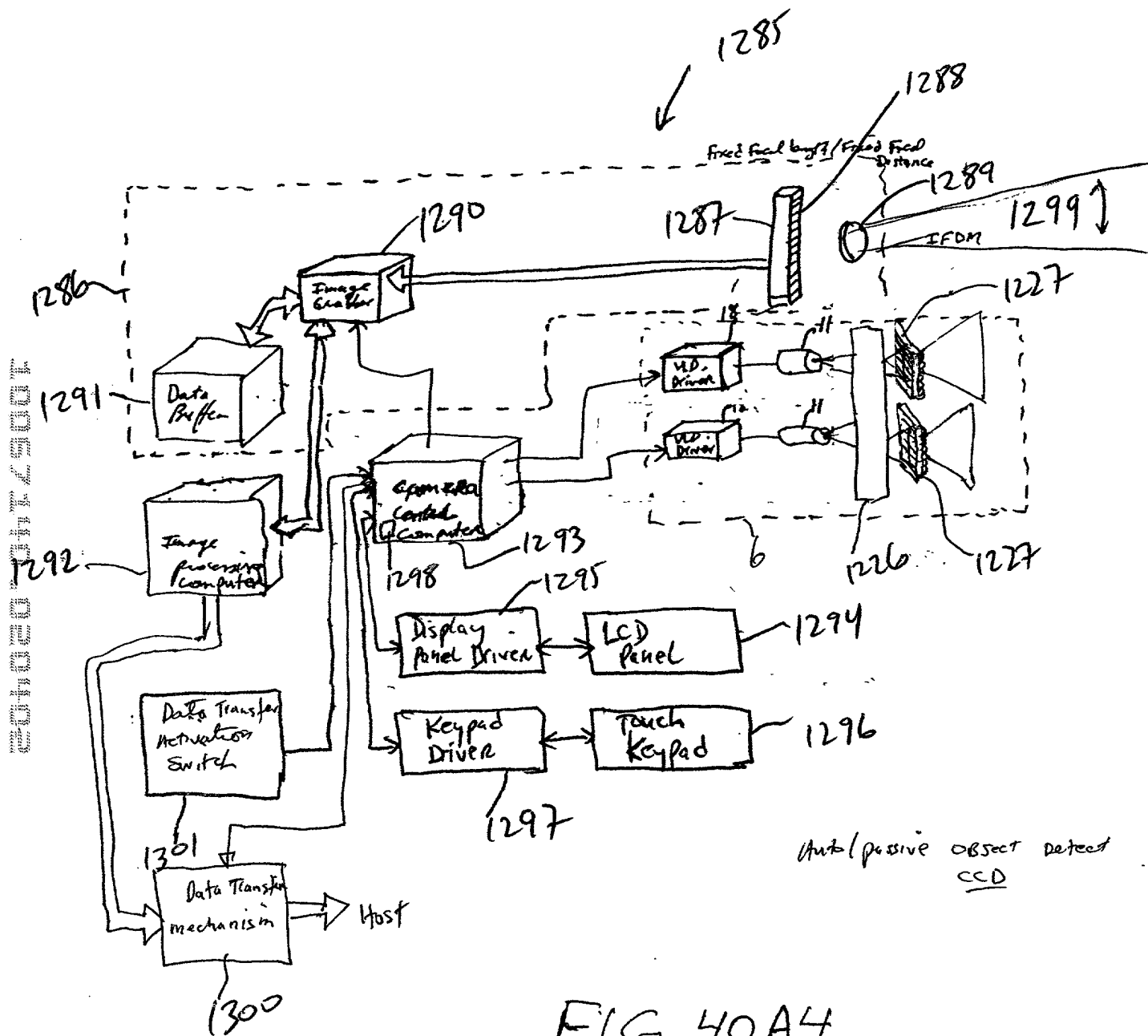
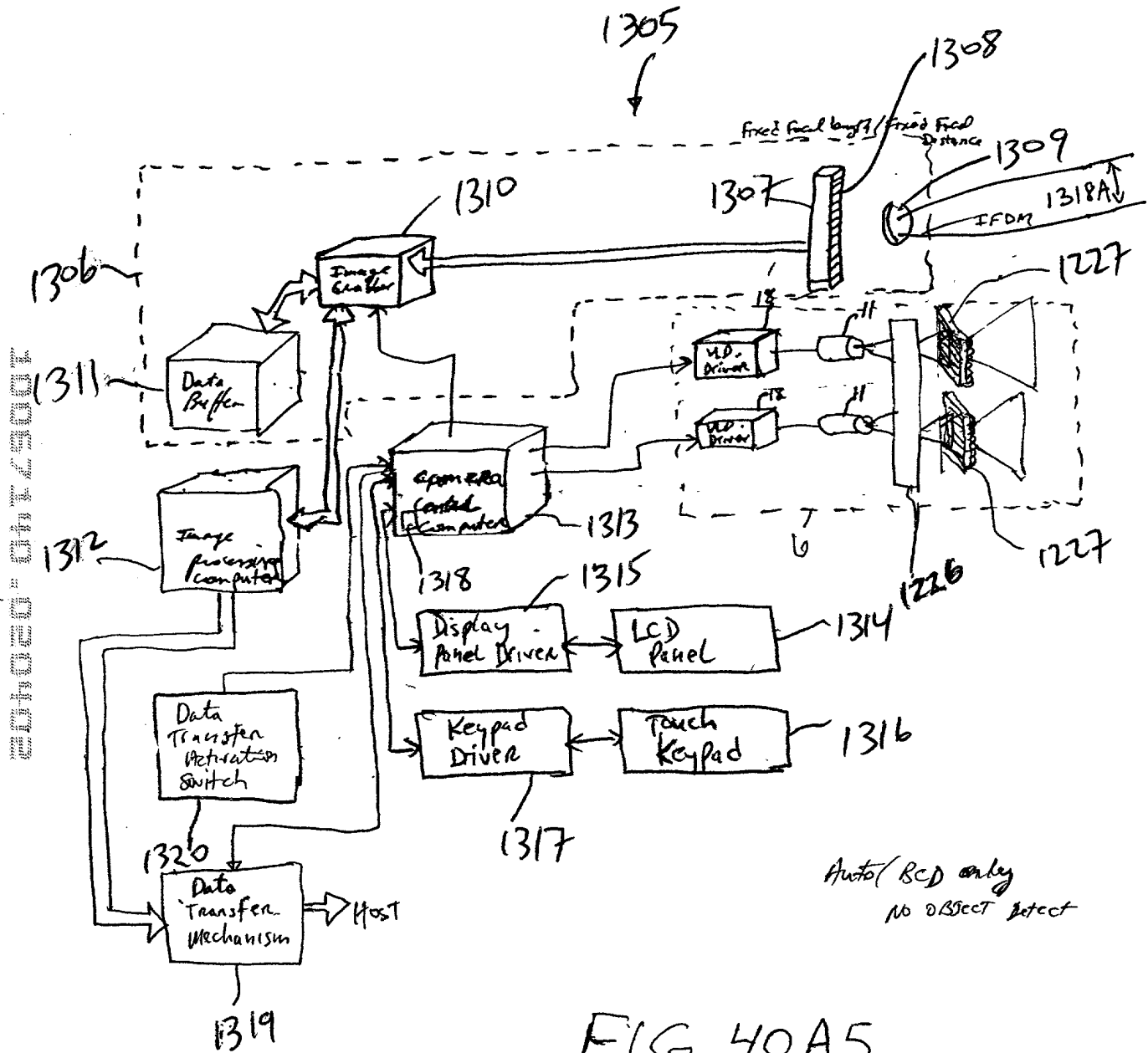


FIG. 40A4

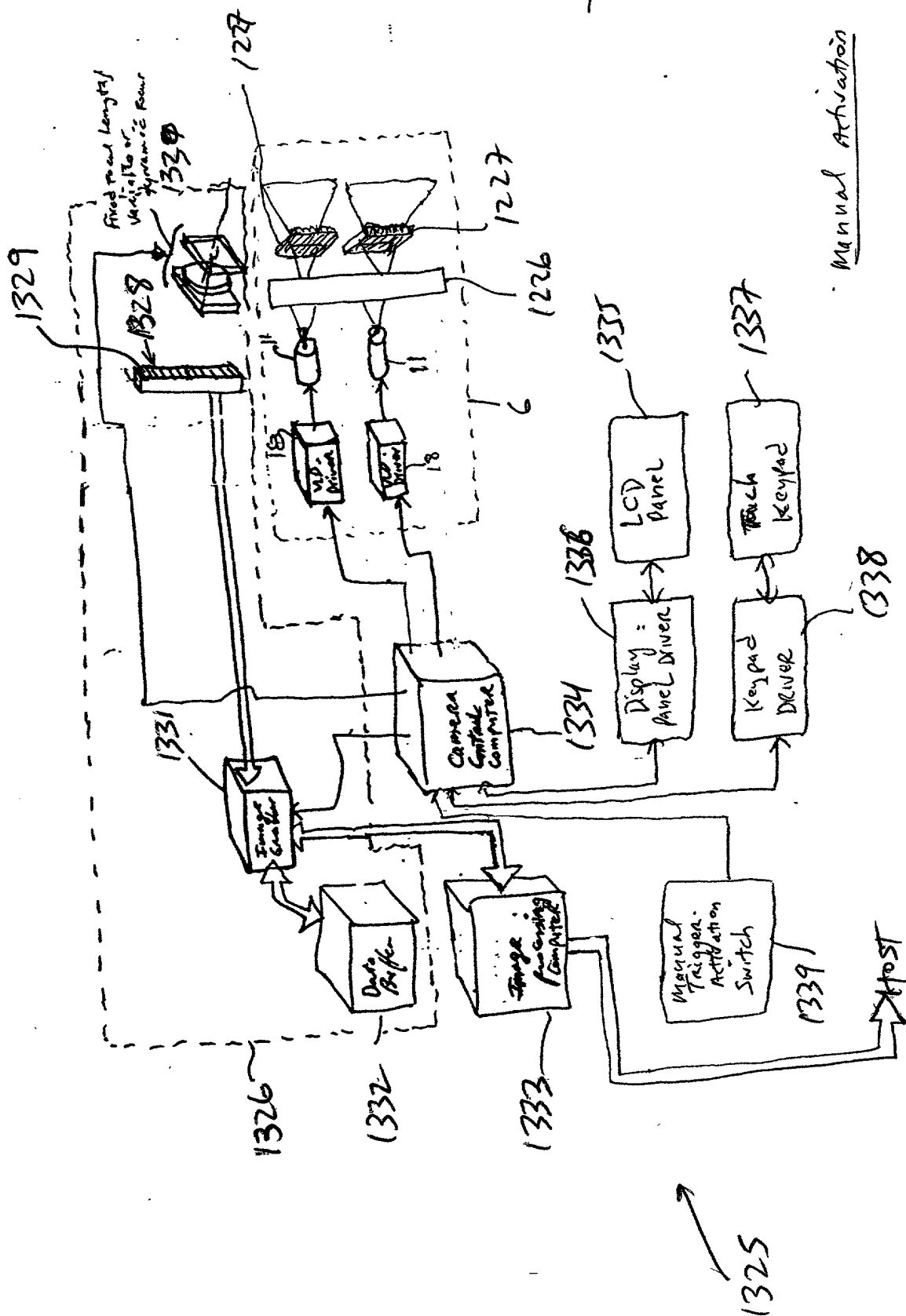
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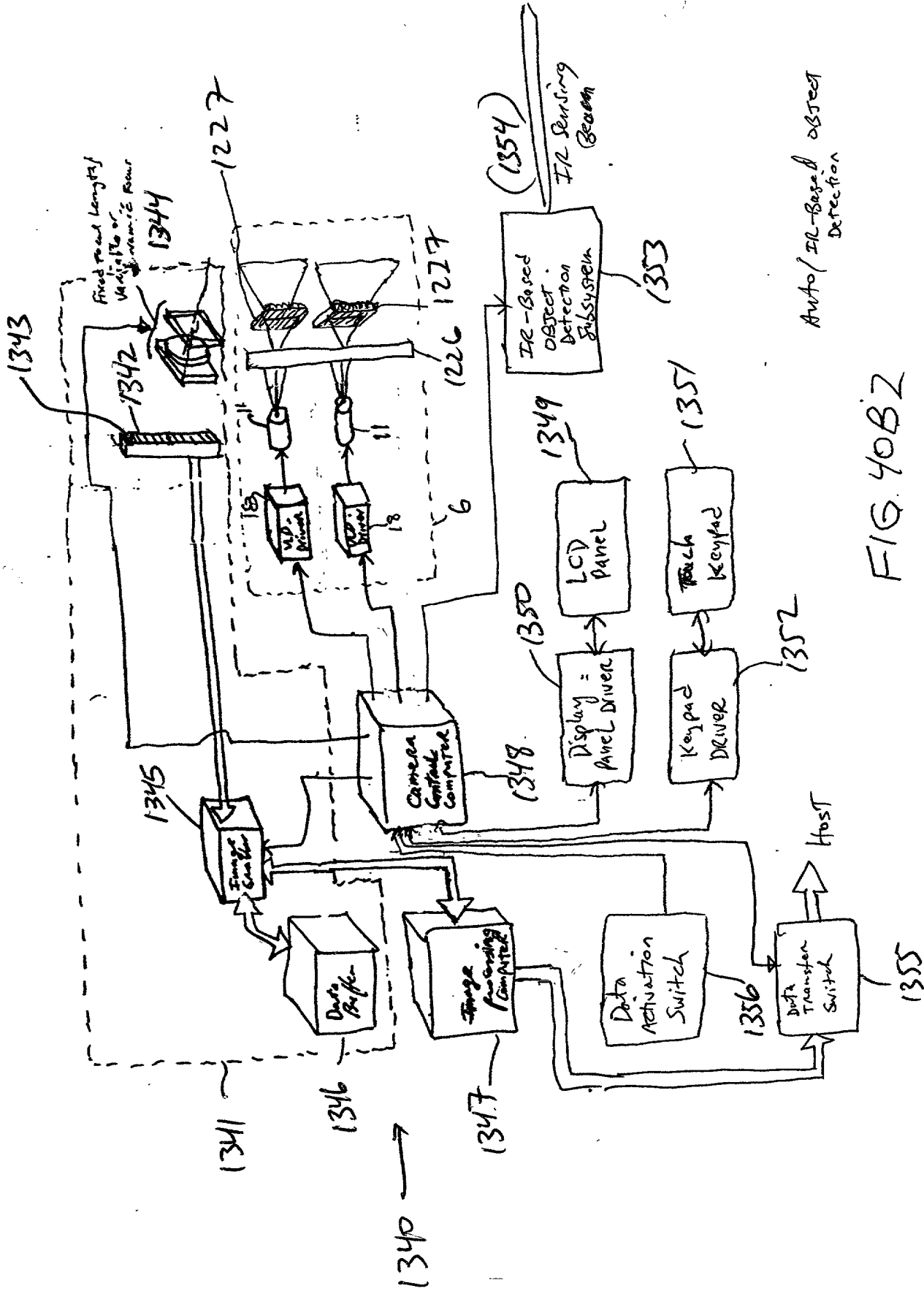


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Manual Activation

FIG. 40B1





Auto/IR-Based object
Detection

FIG. 40B2

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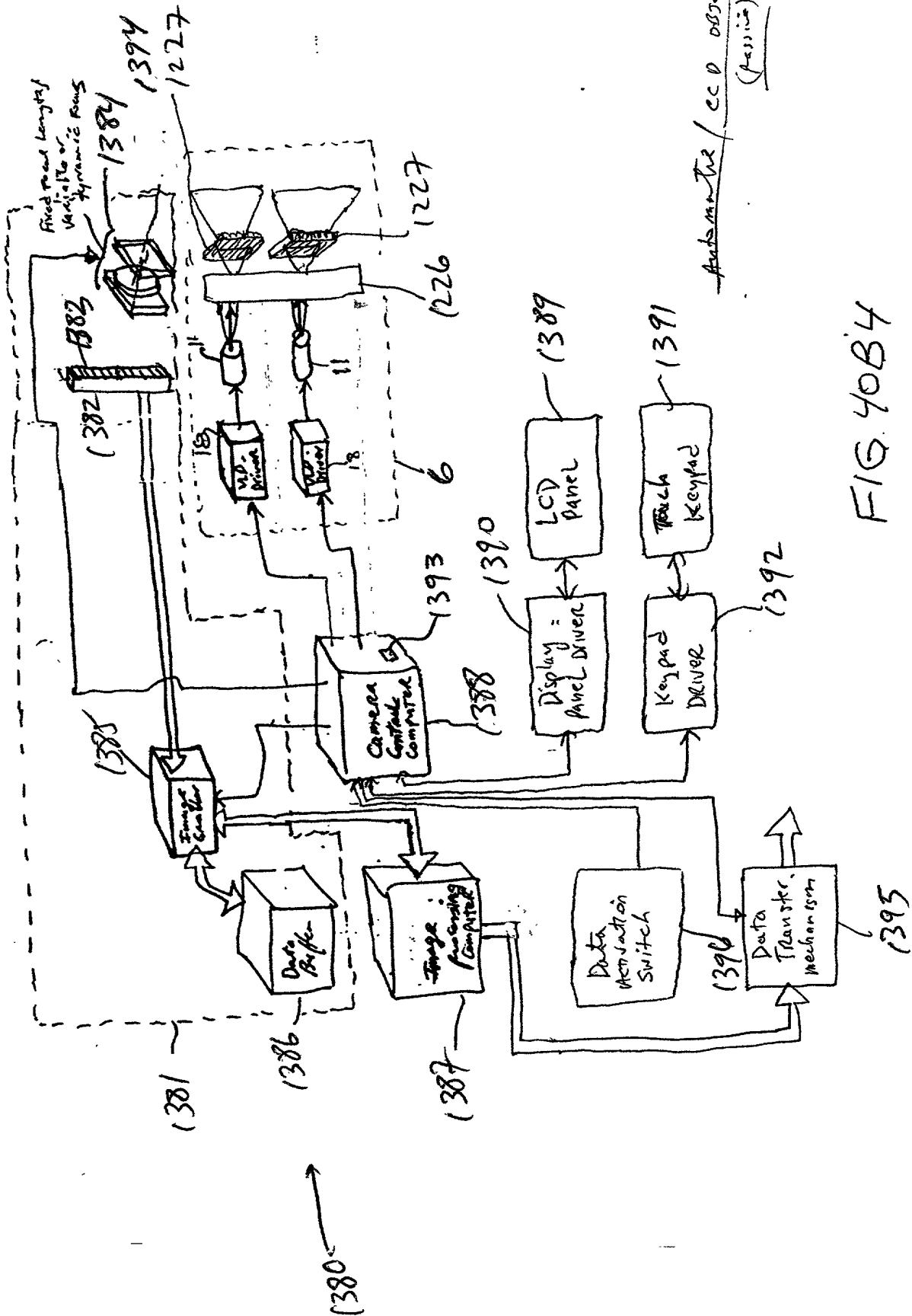


FIG. 40B4

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FIG. 40B5

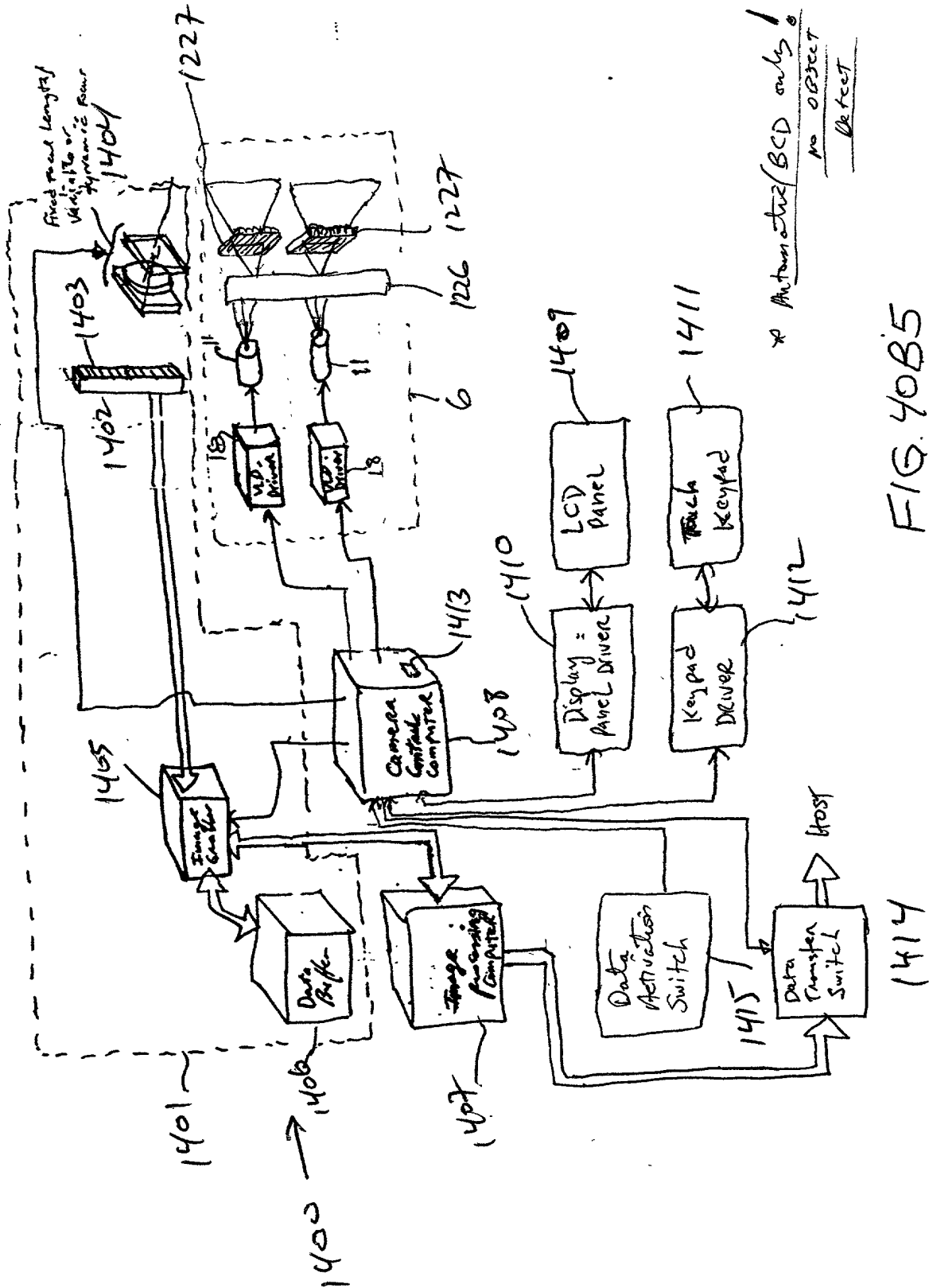
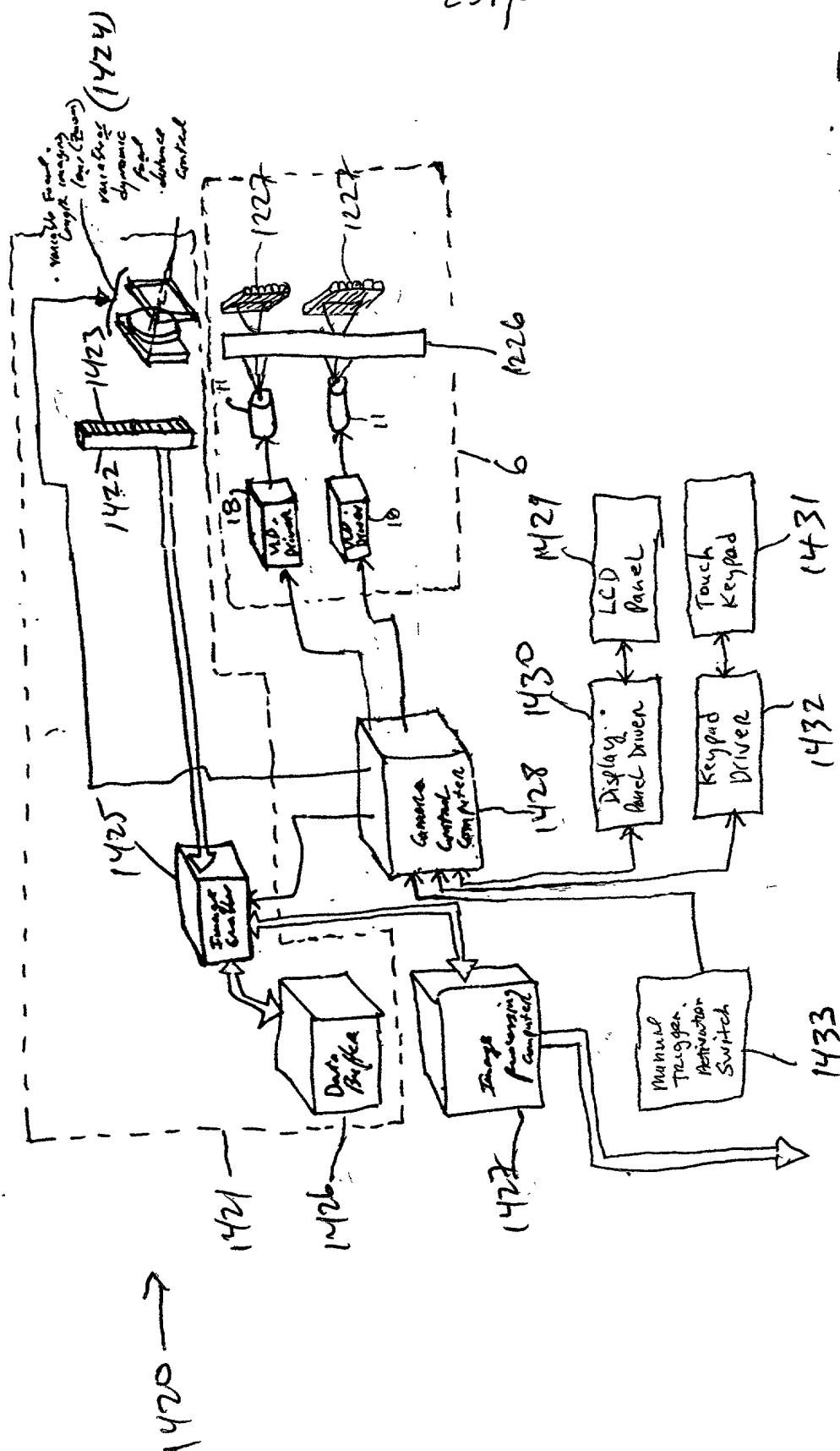


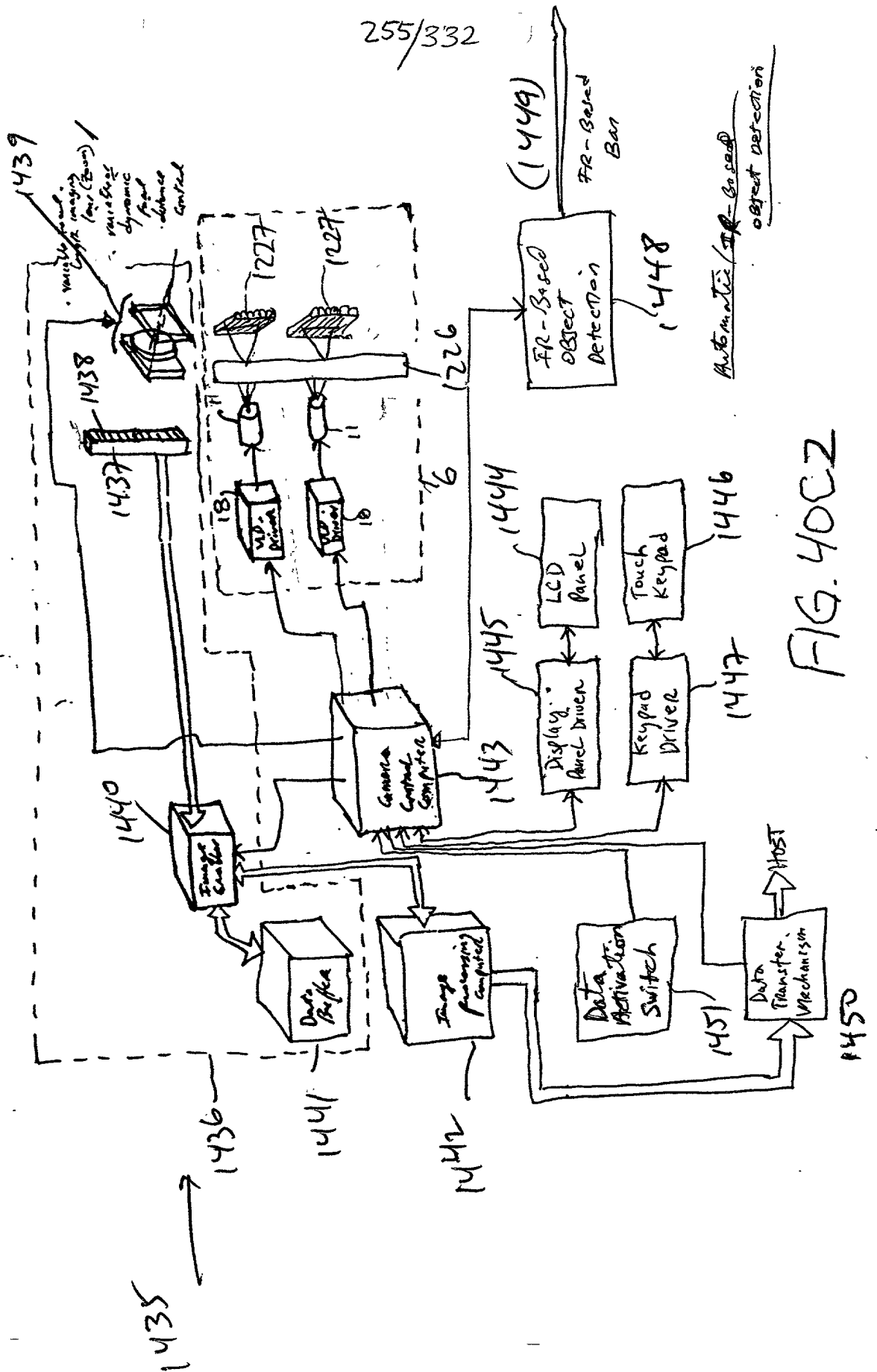
FIG. 40B5

1414



Maximal Activation

FIG. 40C1



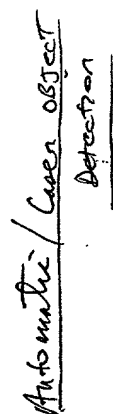


FIG. 40C3

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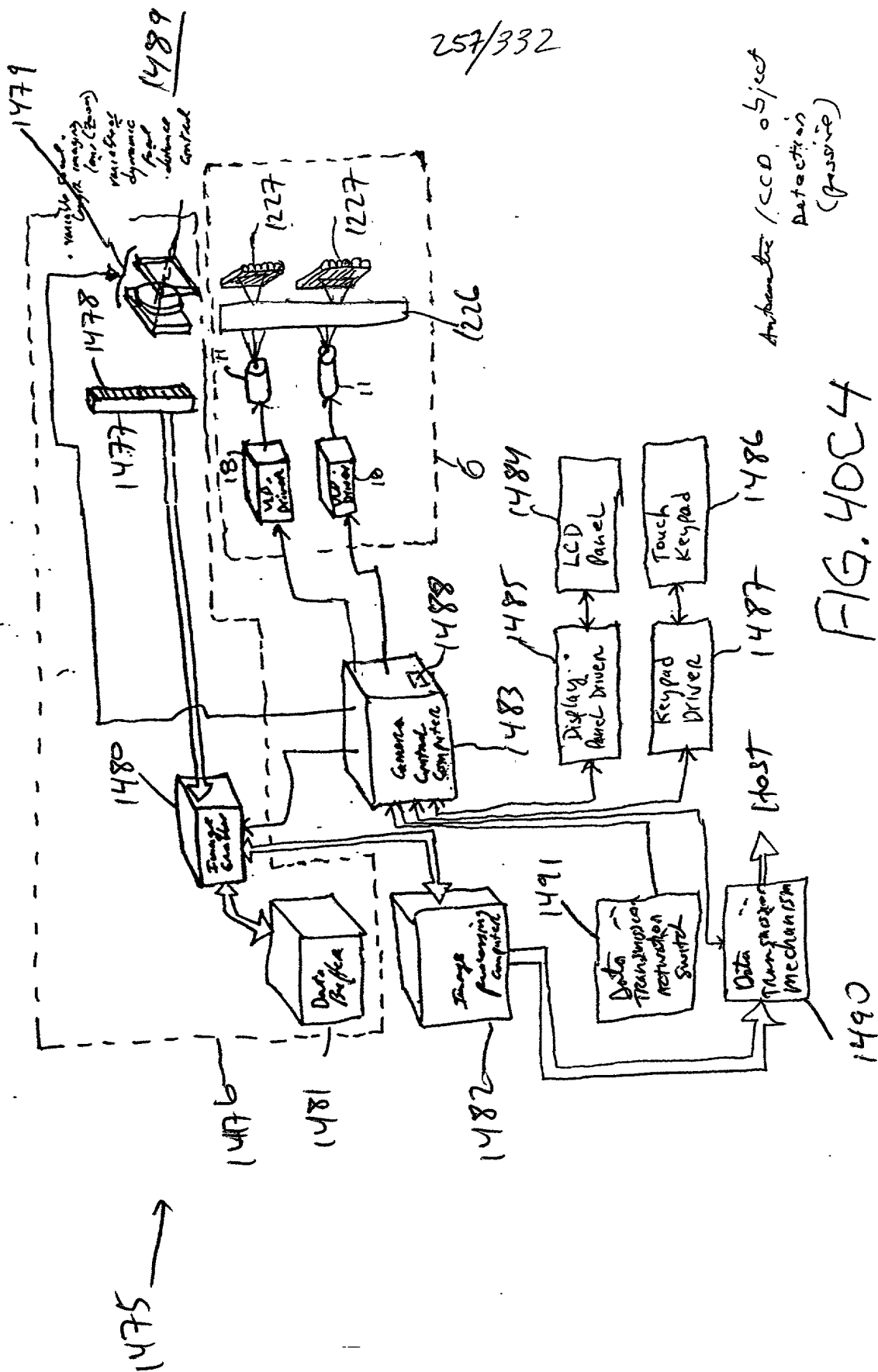


FIG. 40C4

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1-D
display
in 3D

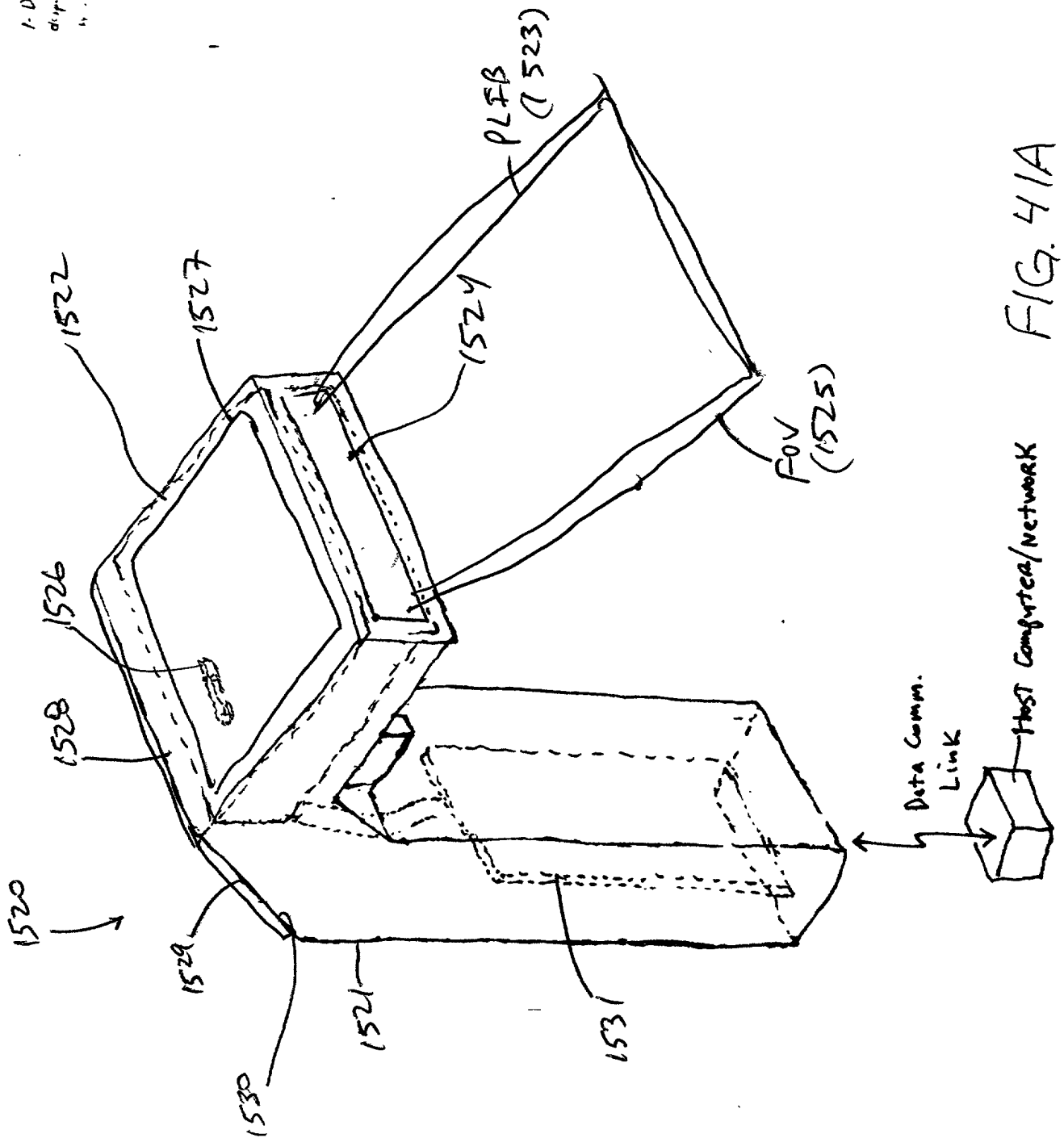


FIG. 41A

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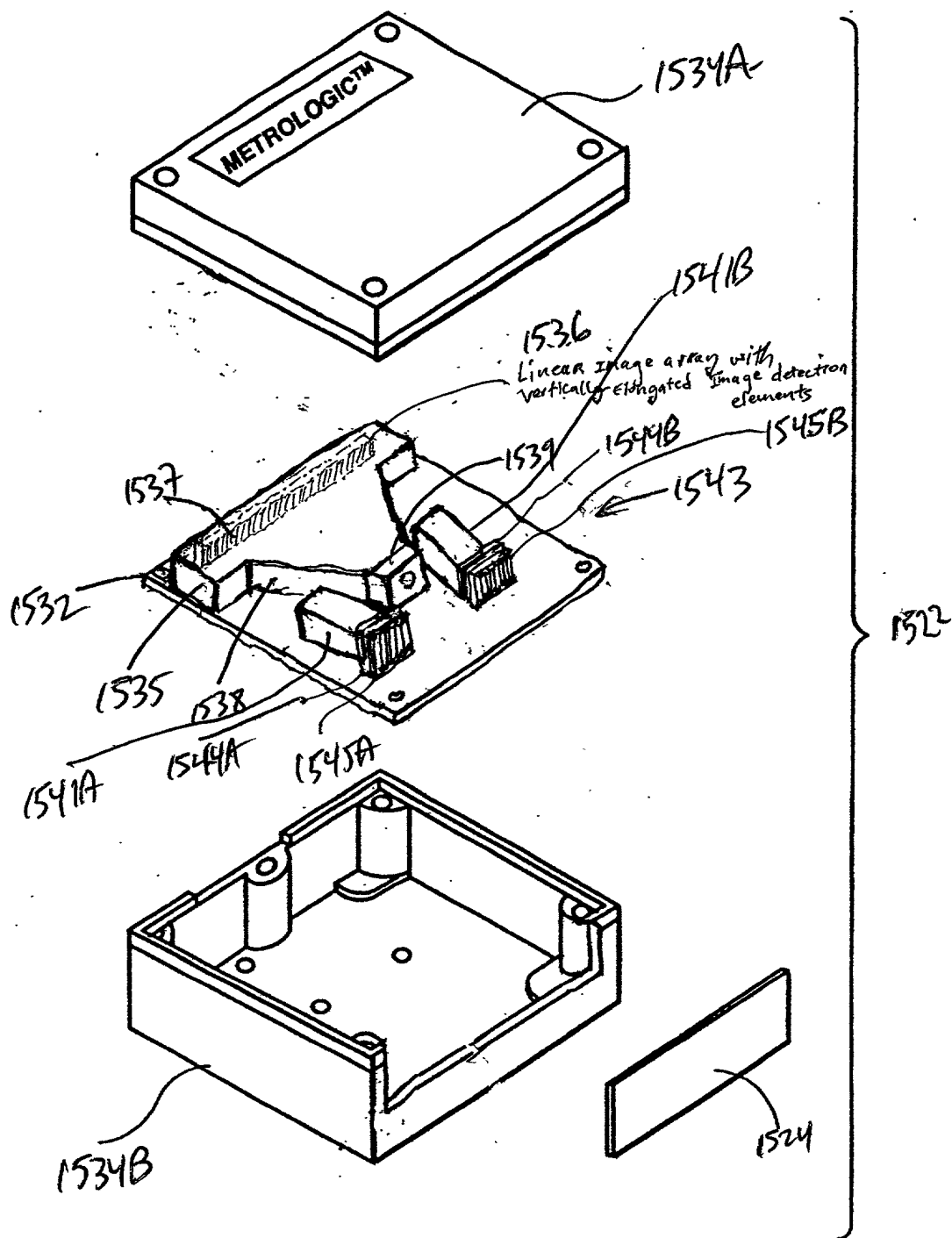


FIG. 41B

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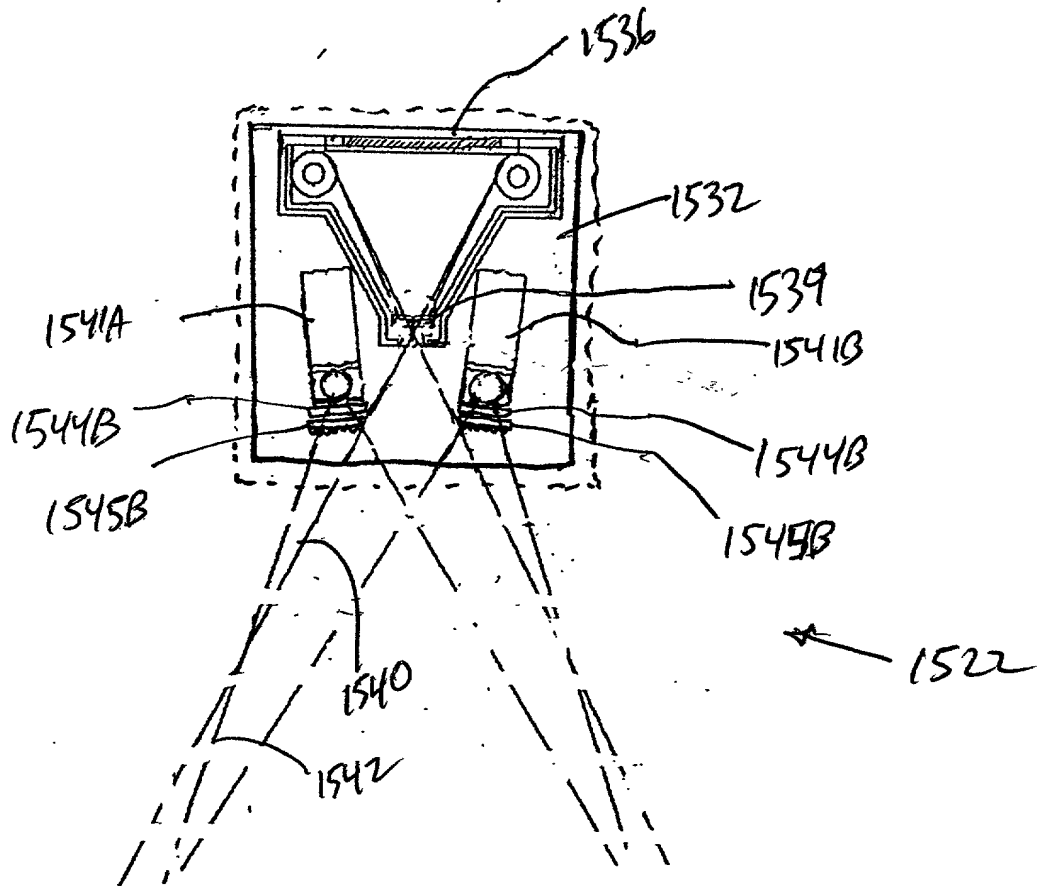


FIG. 41C

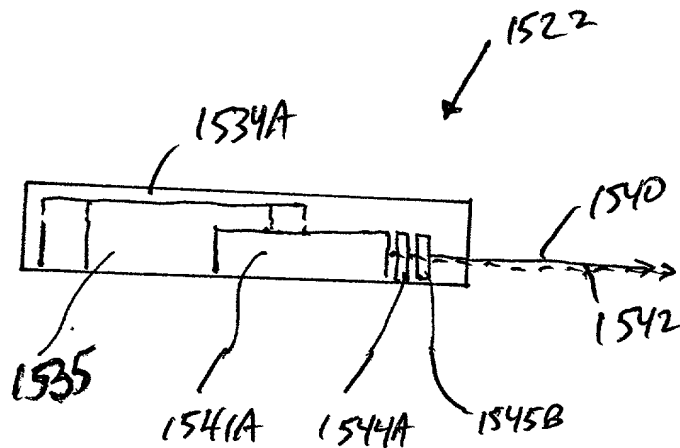


FIG. 41D

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1-D
display
unit

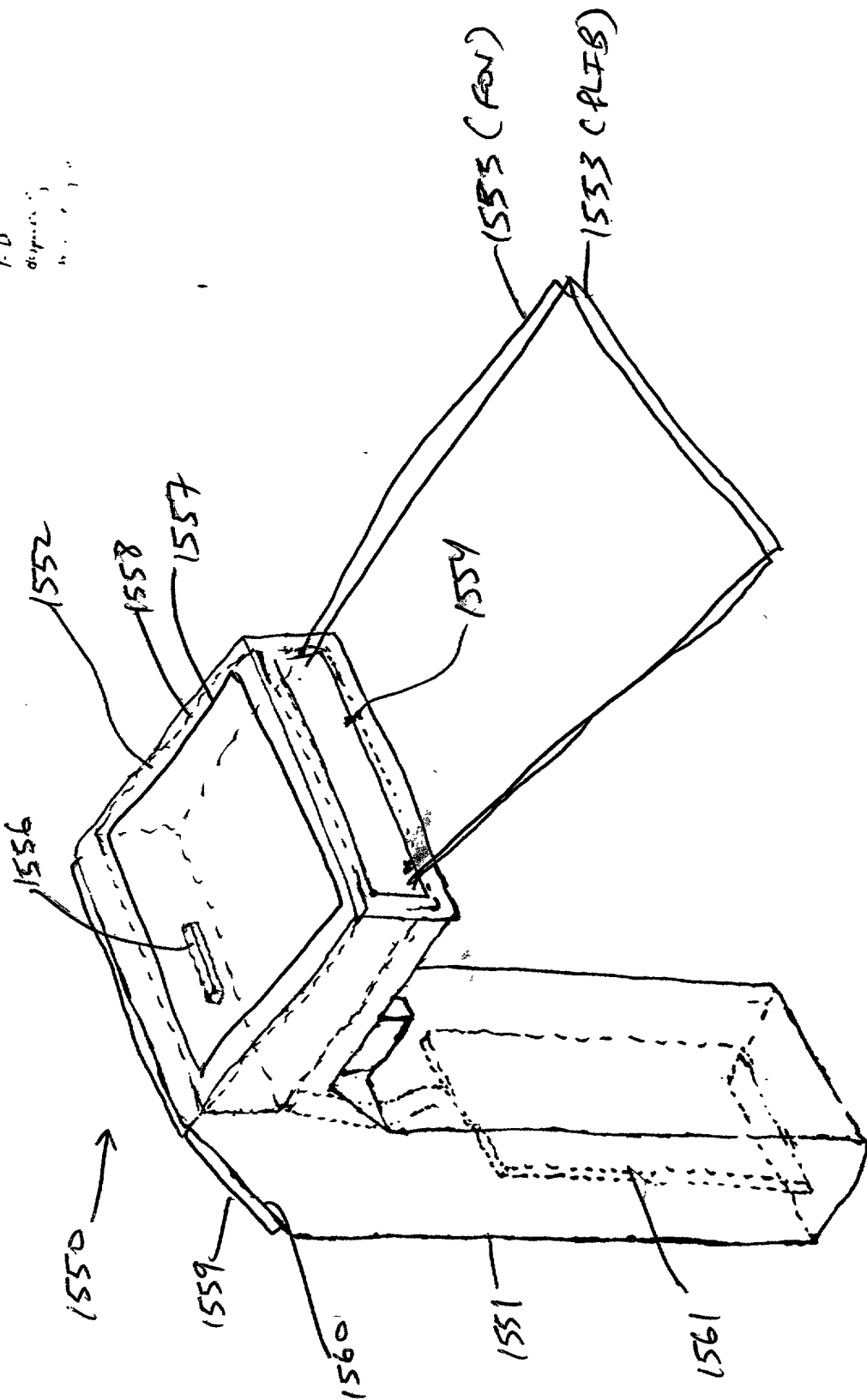


FIG. 42A

Host Computer/Network

Data Comm.
Link

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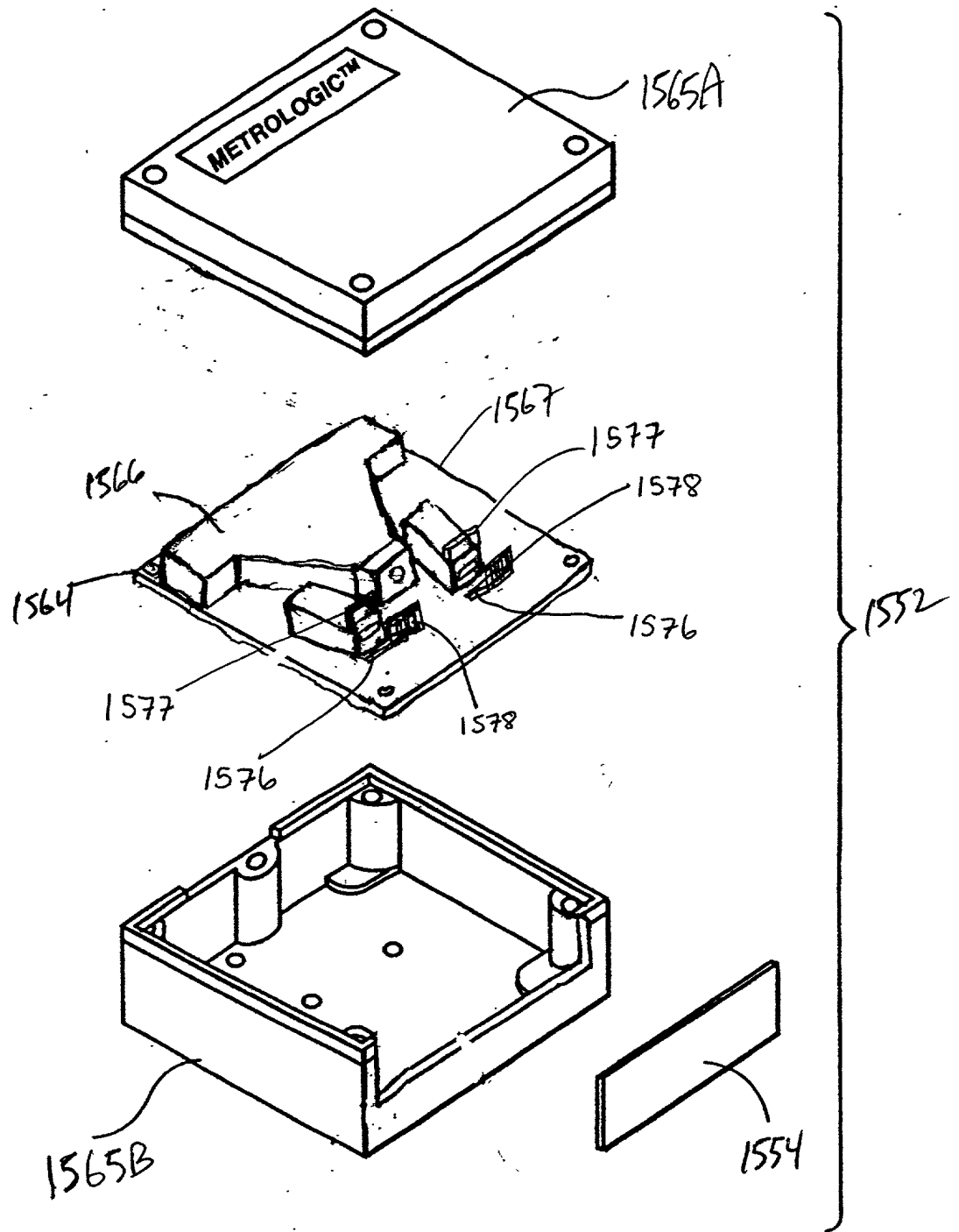


FIG. 42B

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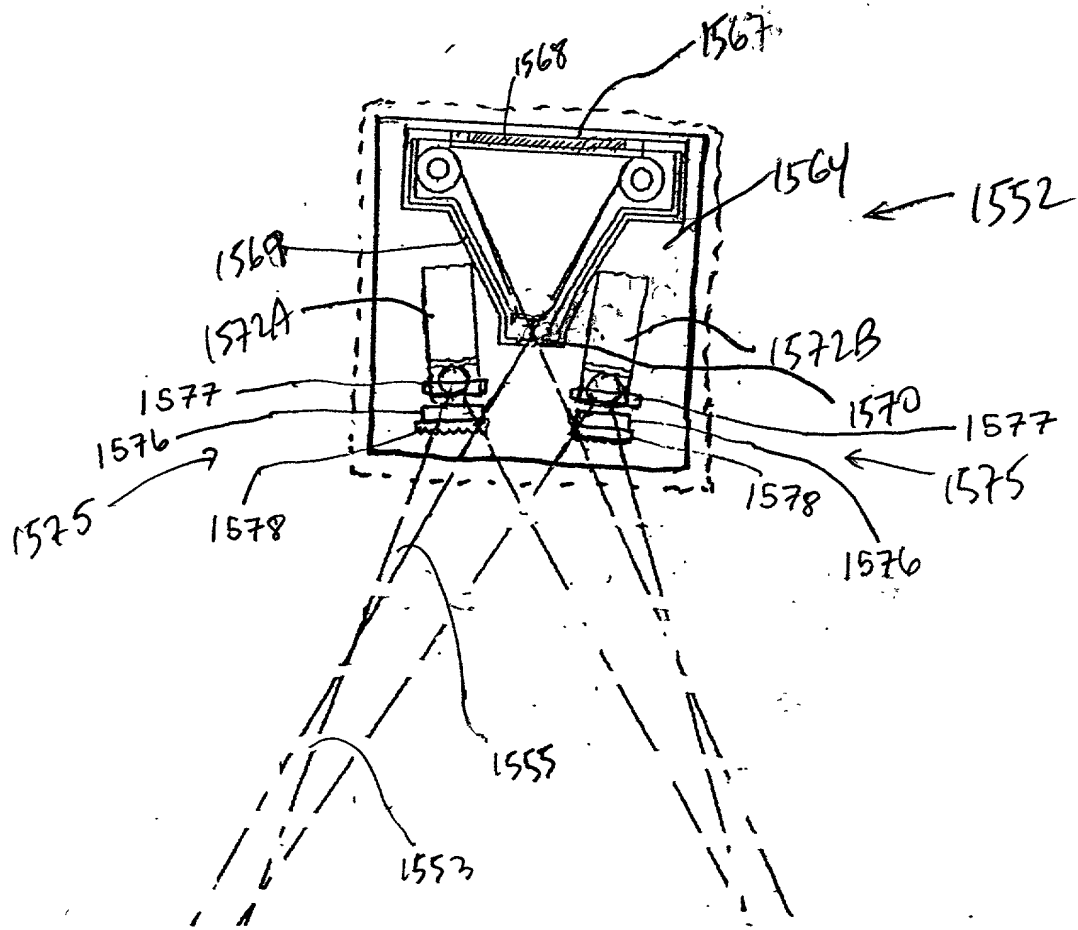


FIG. 42C

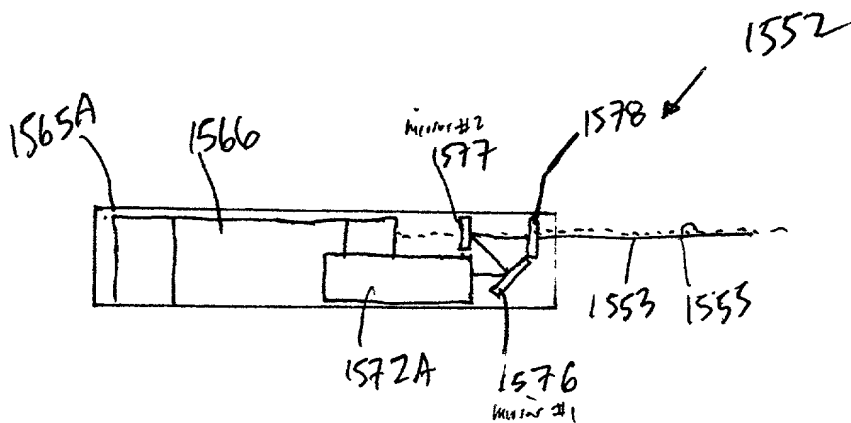


FIG. 42D

FIG. 43A

1-D
displacement
...

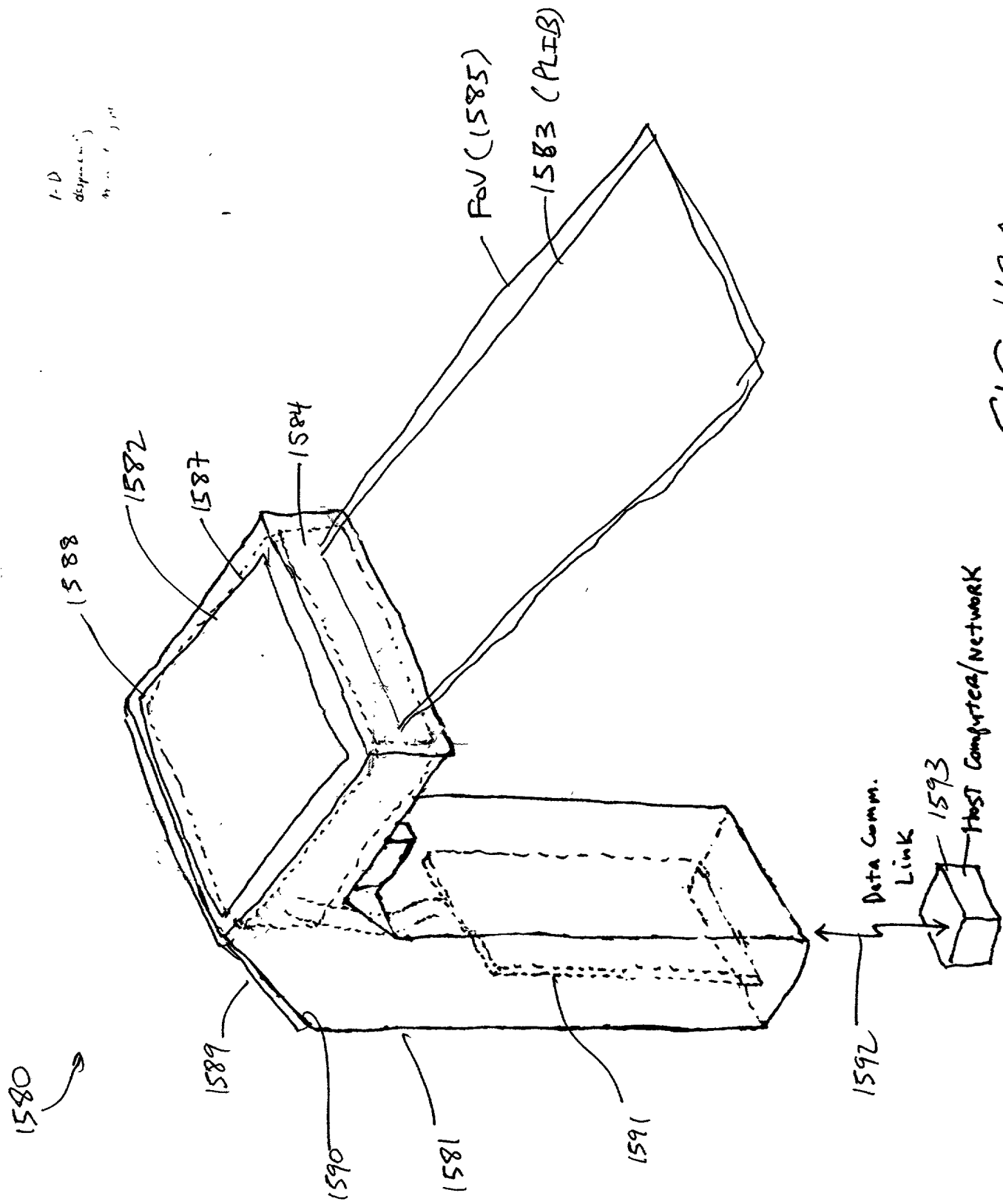


FIG. 43A

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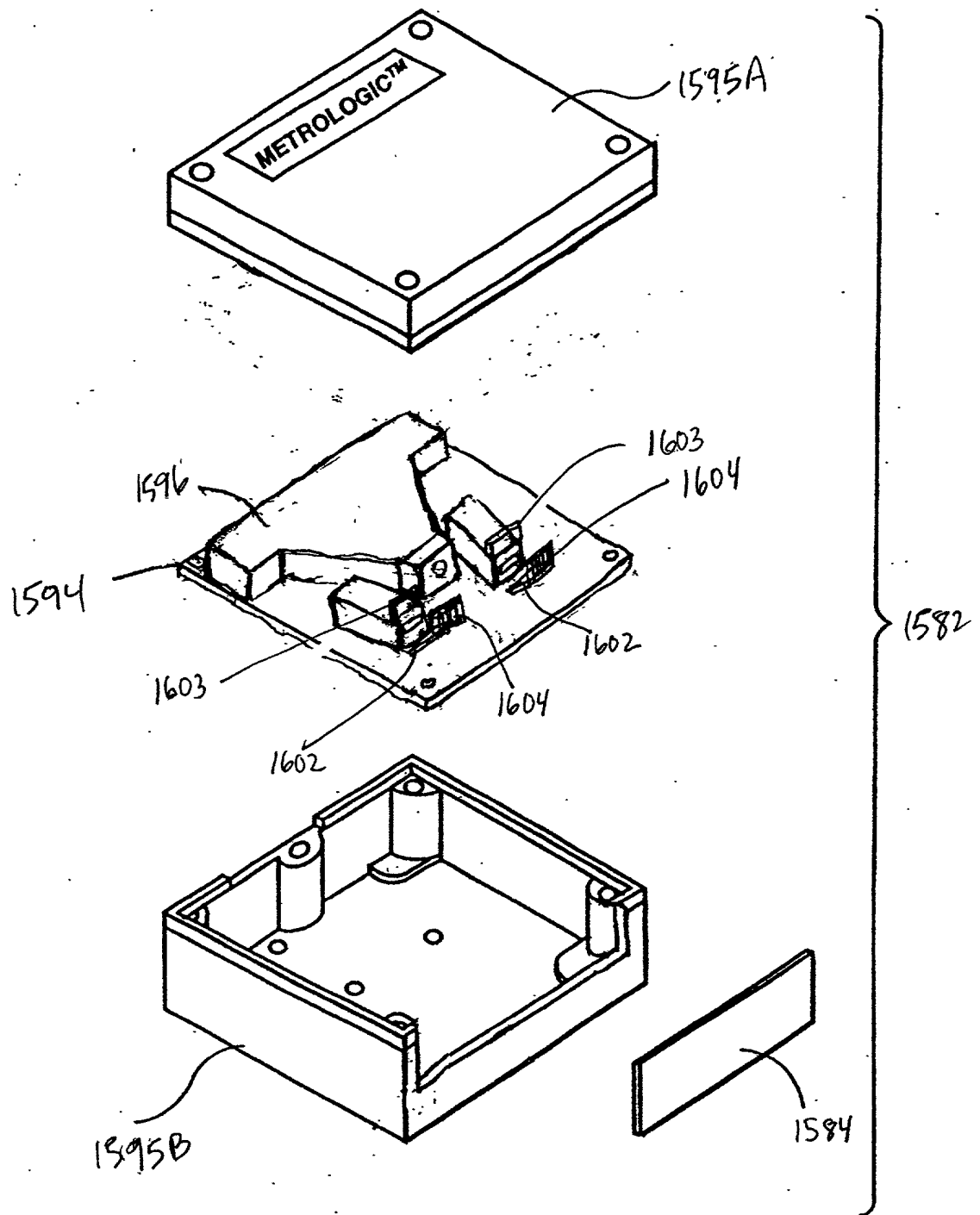
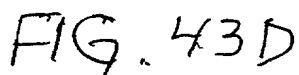
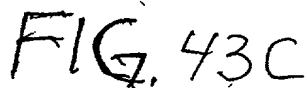


FIG. 43B



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10067410.020402

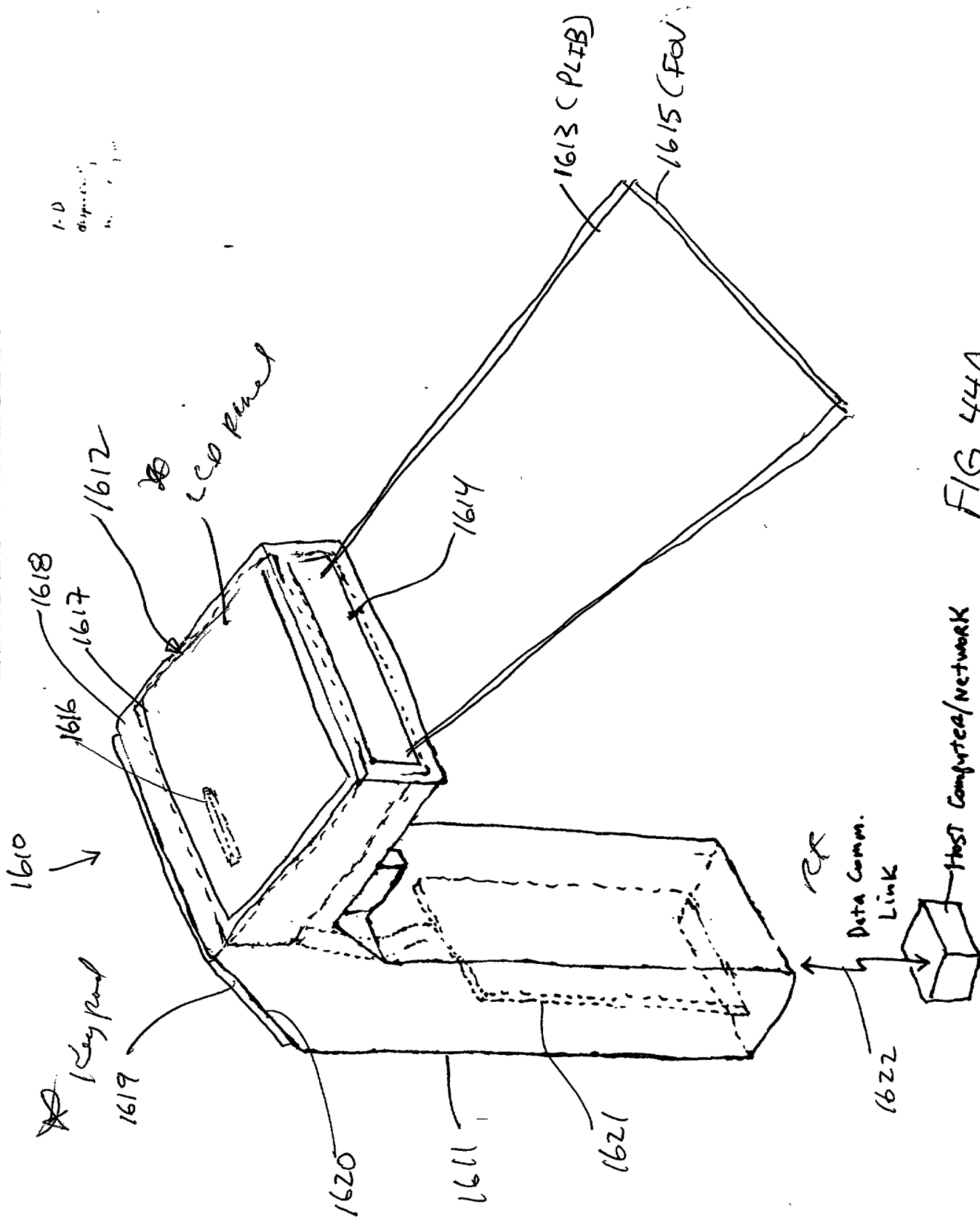


FIG. 44A

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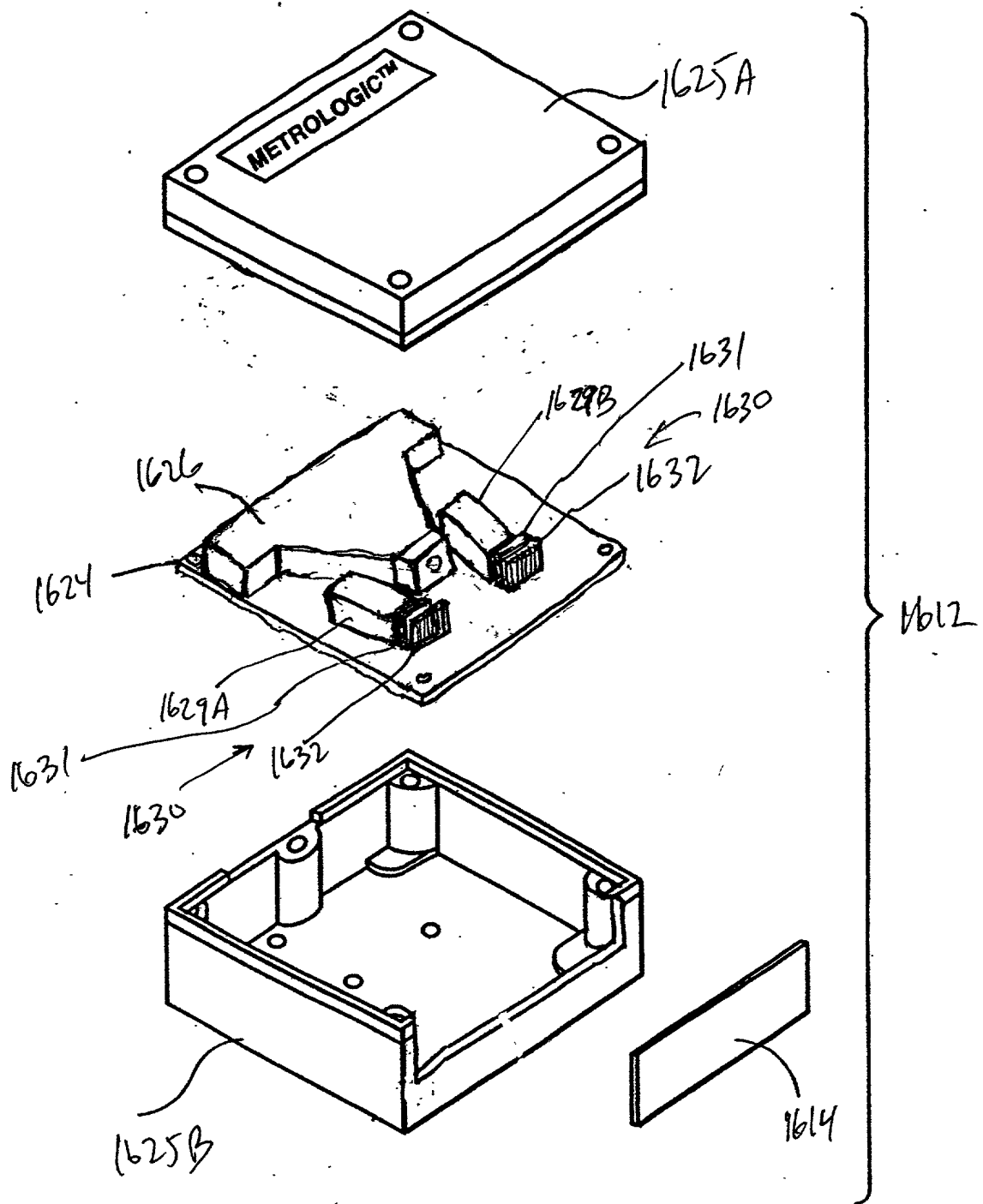
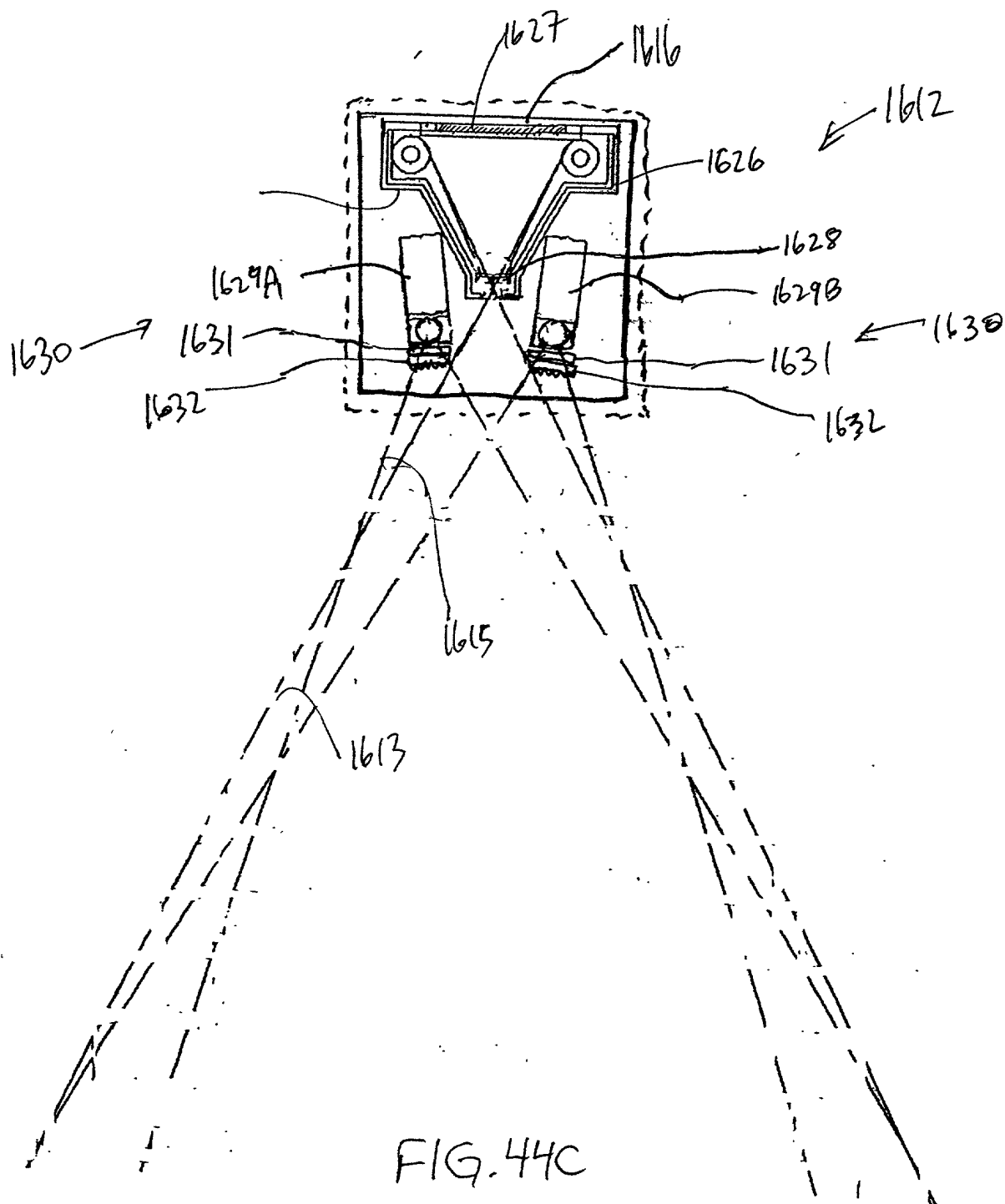


FIG. 44B

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I-D
displaying
from 1635 to

2010203-011/5001

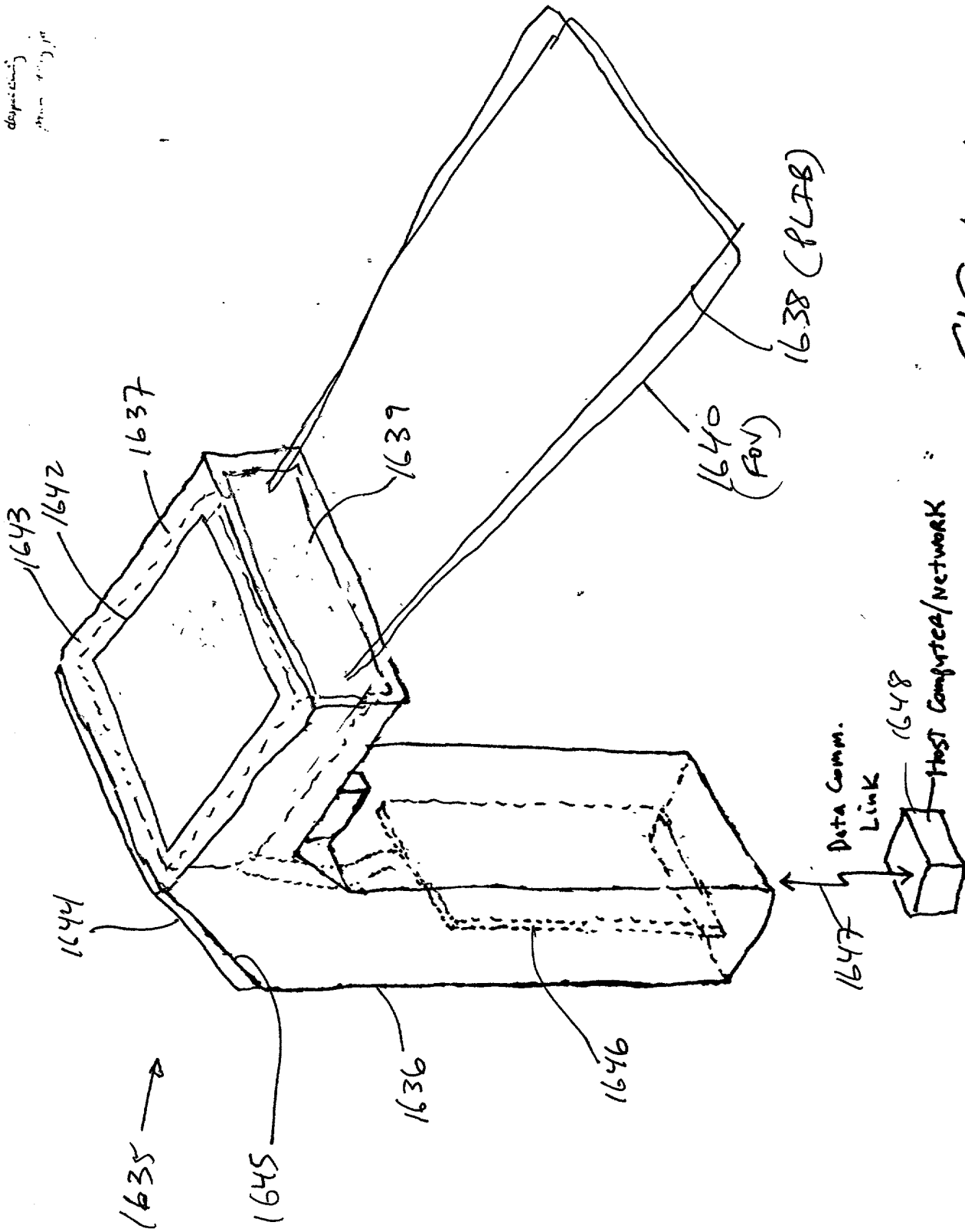


FIG. 45A

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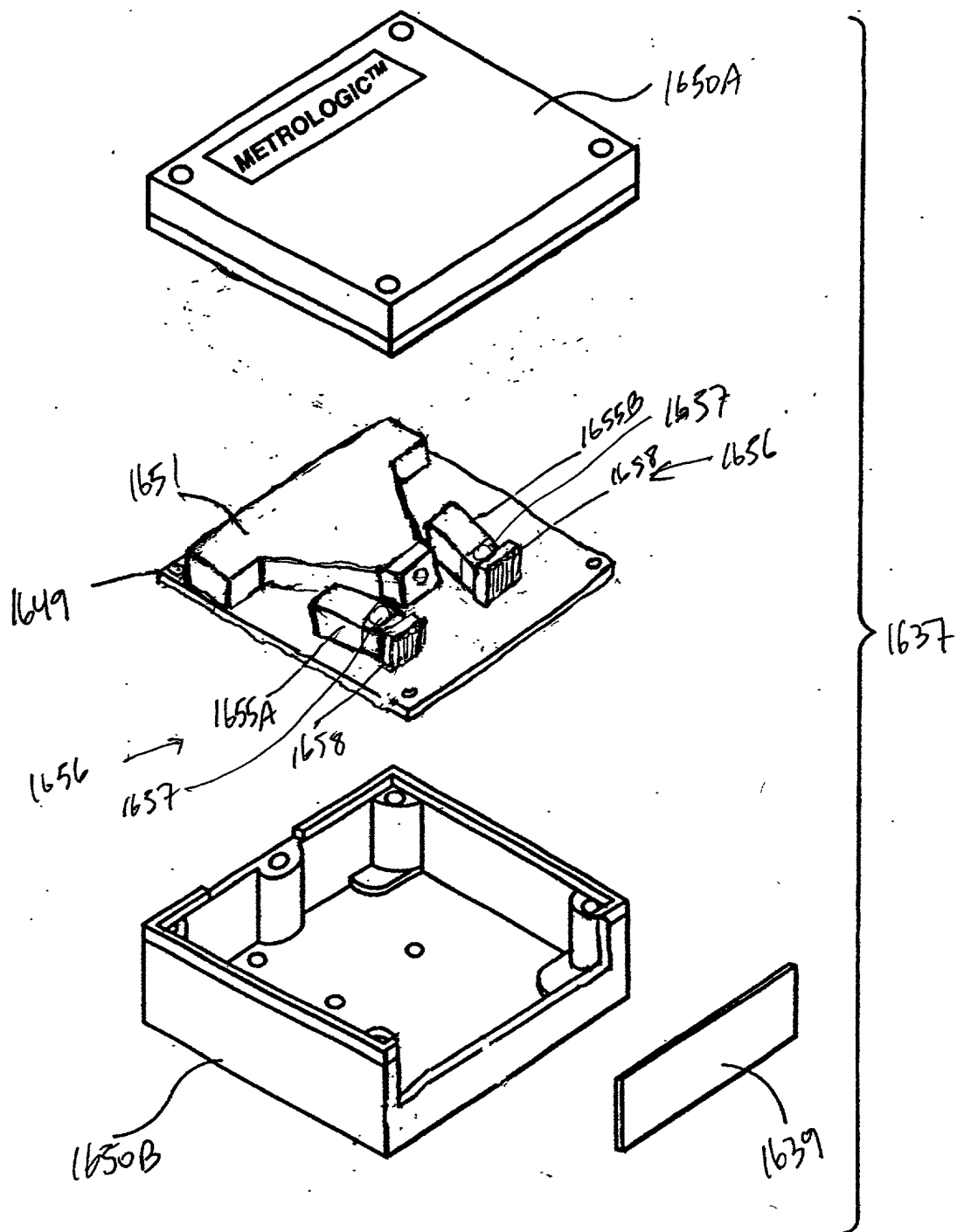


FIG. 45B

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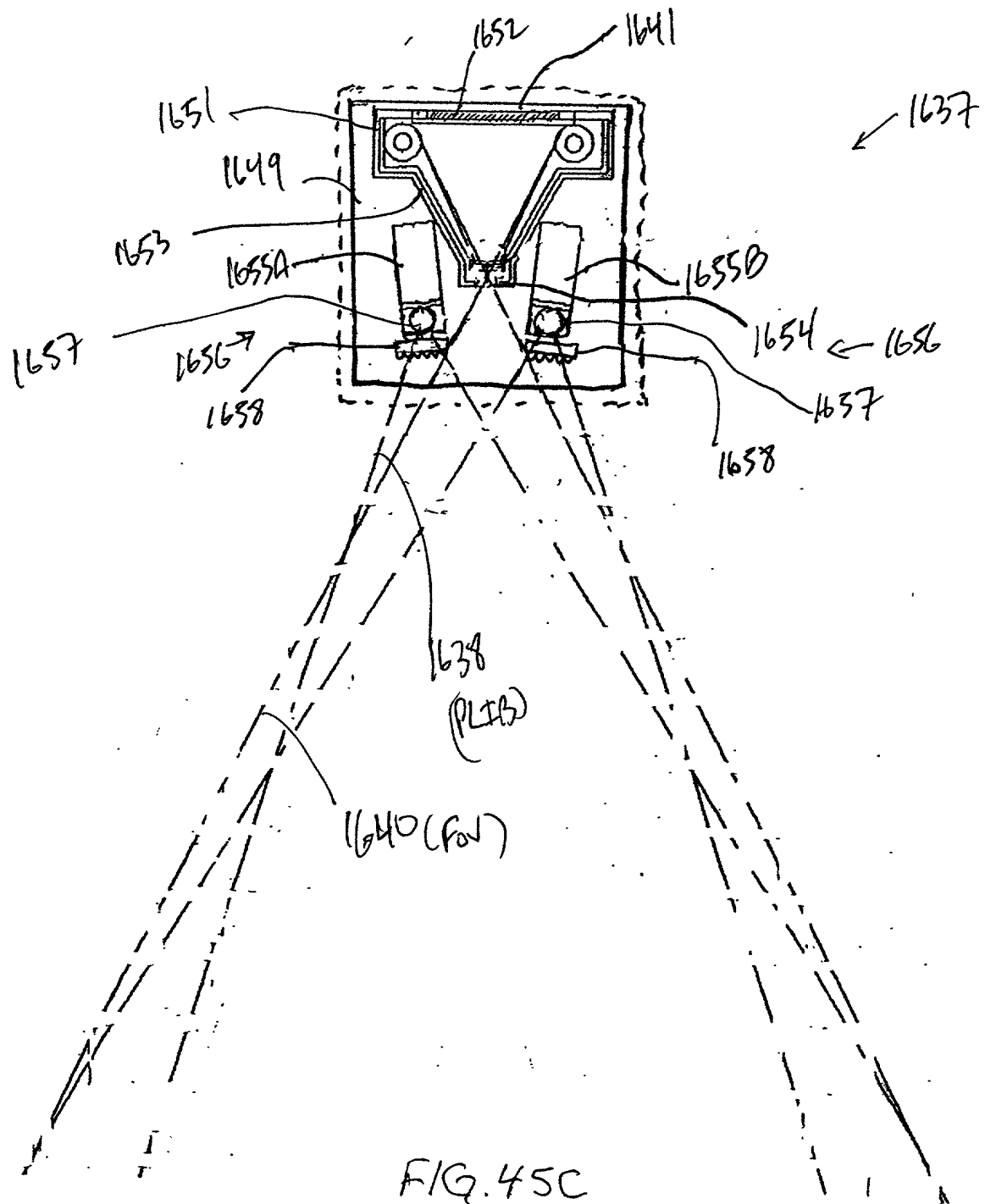


FIG. 45C

20100201 04125001

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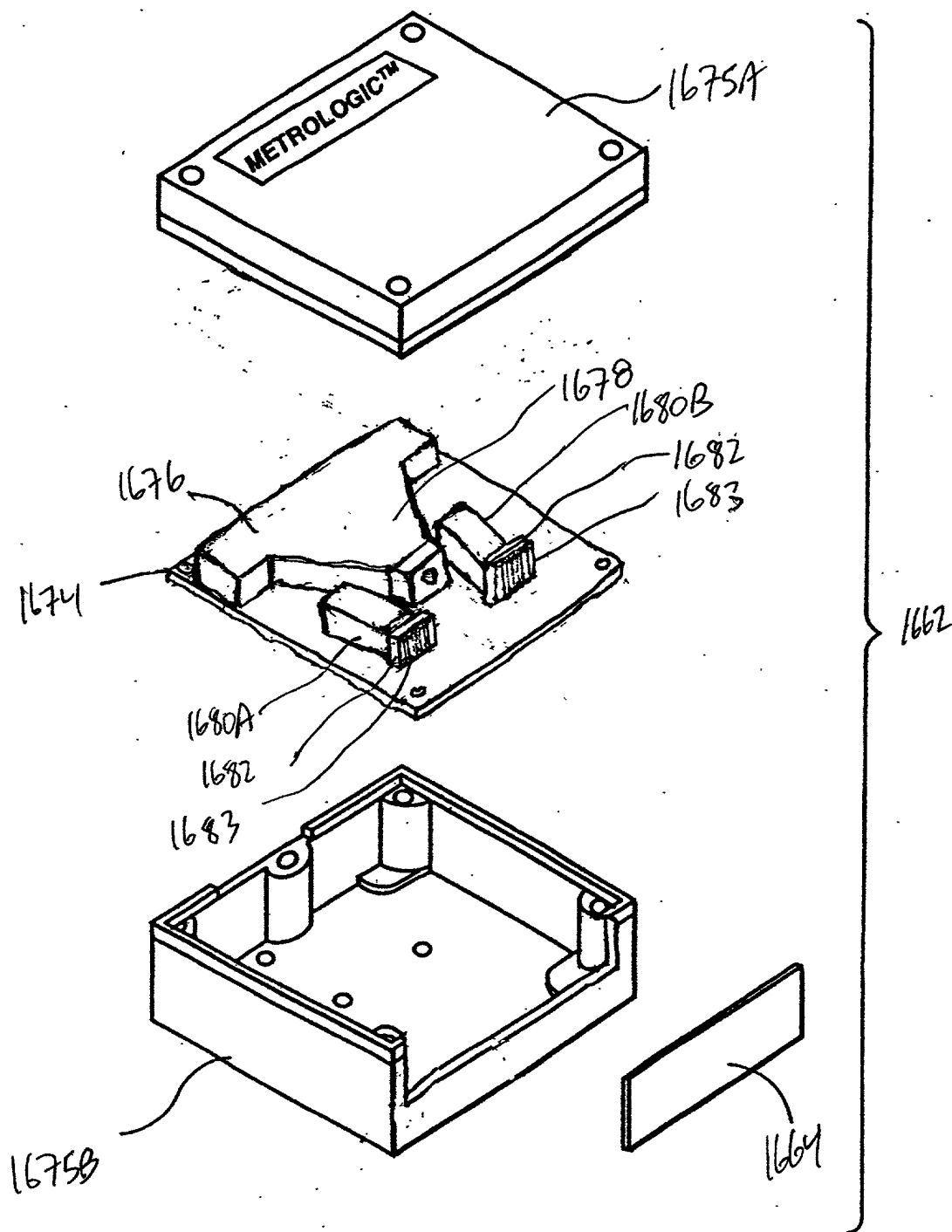


FIG. 46B

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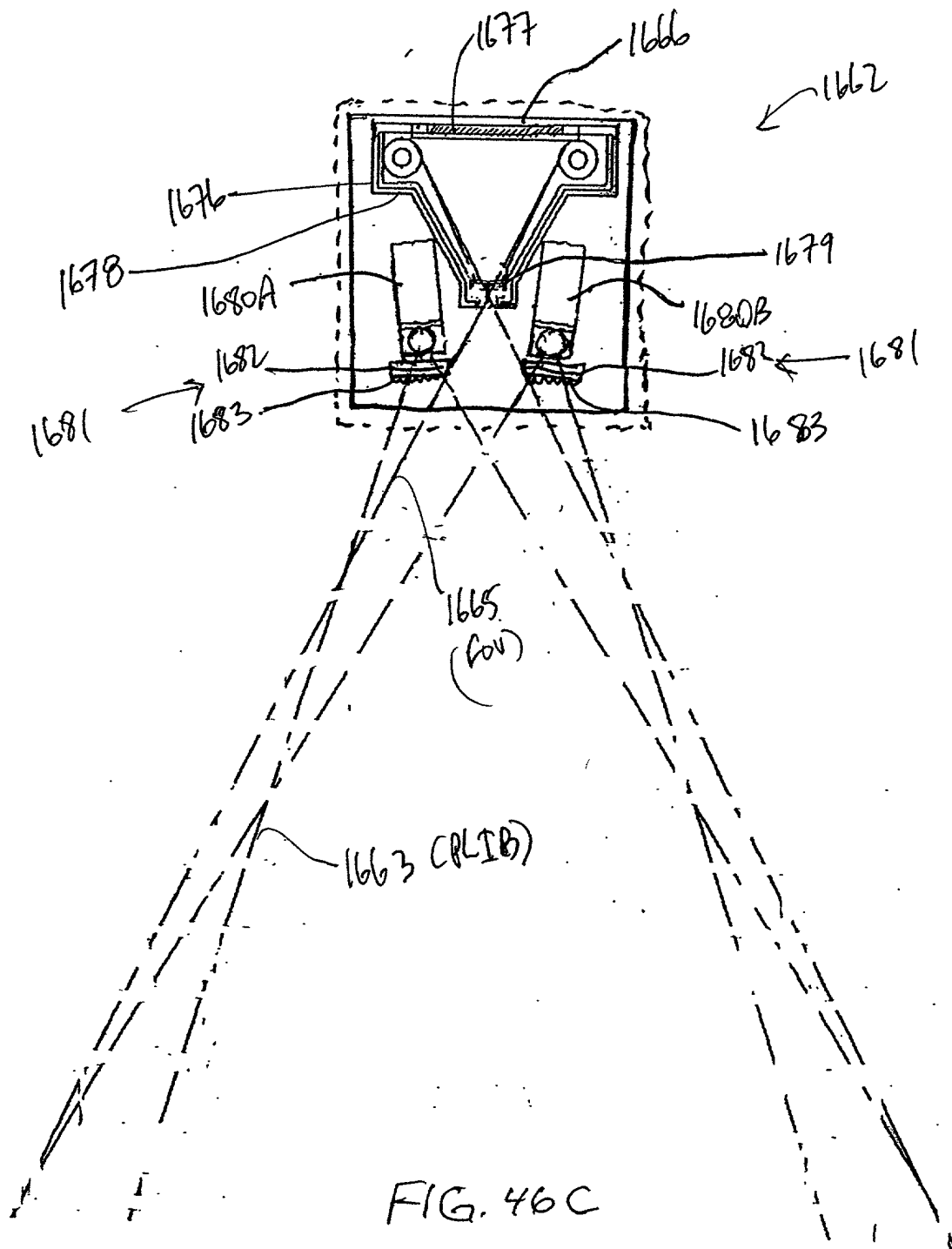


FIG. 46C

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1-D
display
...

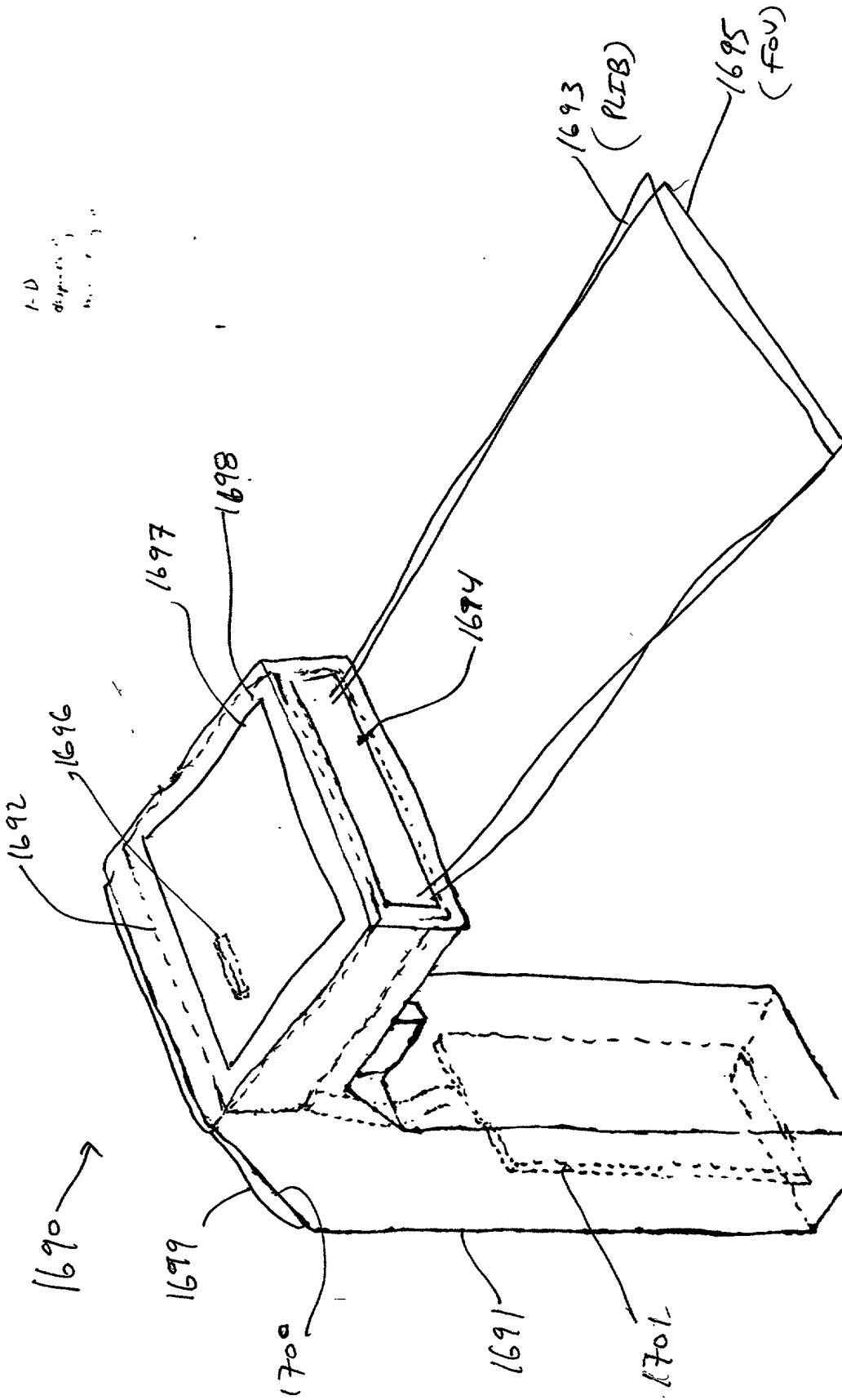


FIG. 47A

Data Comm.
Link



Host Computer/Network

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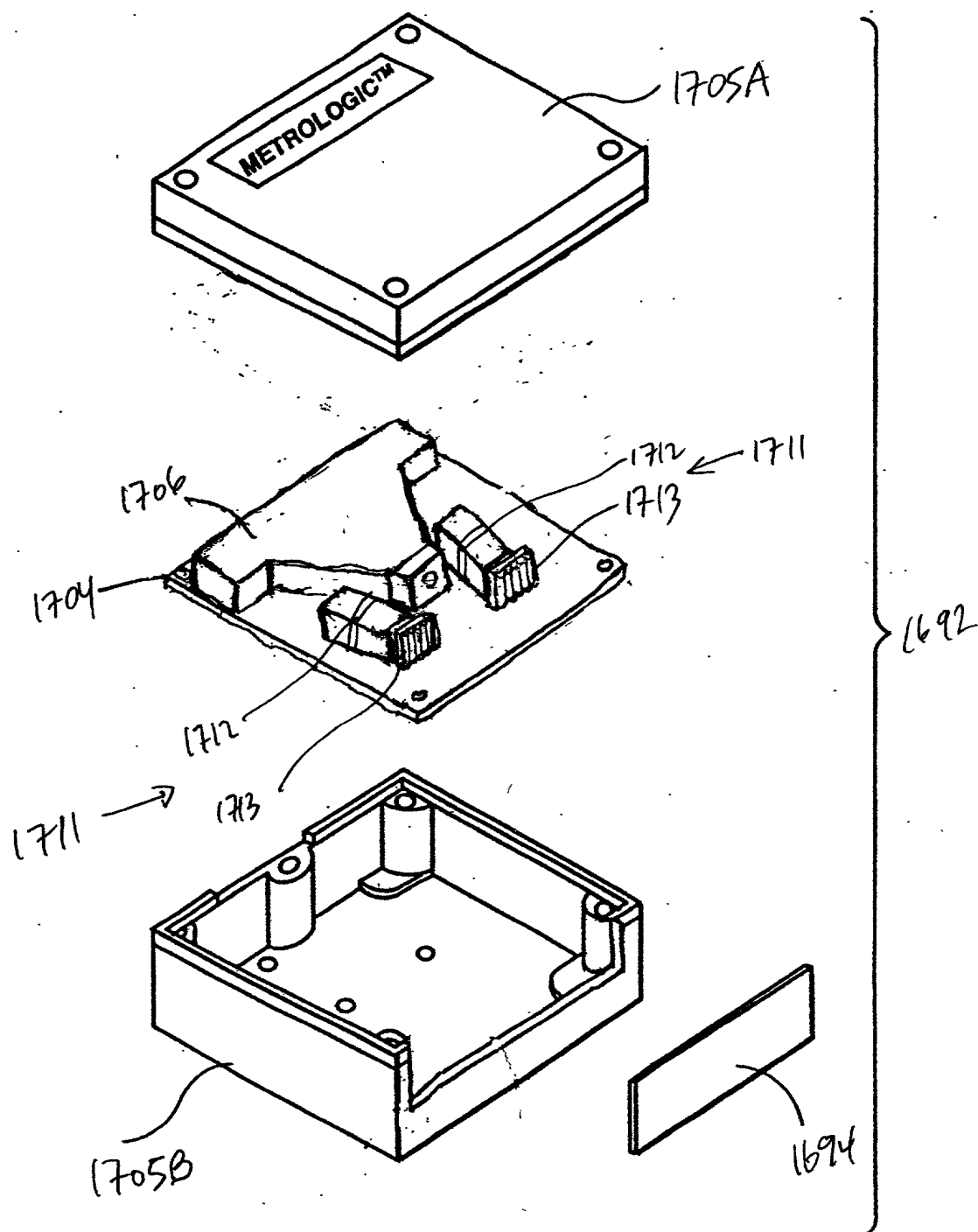
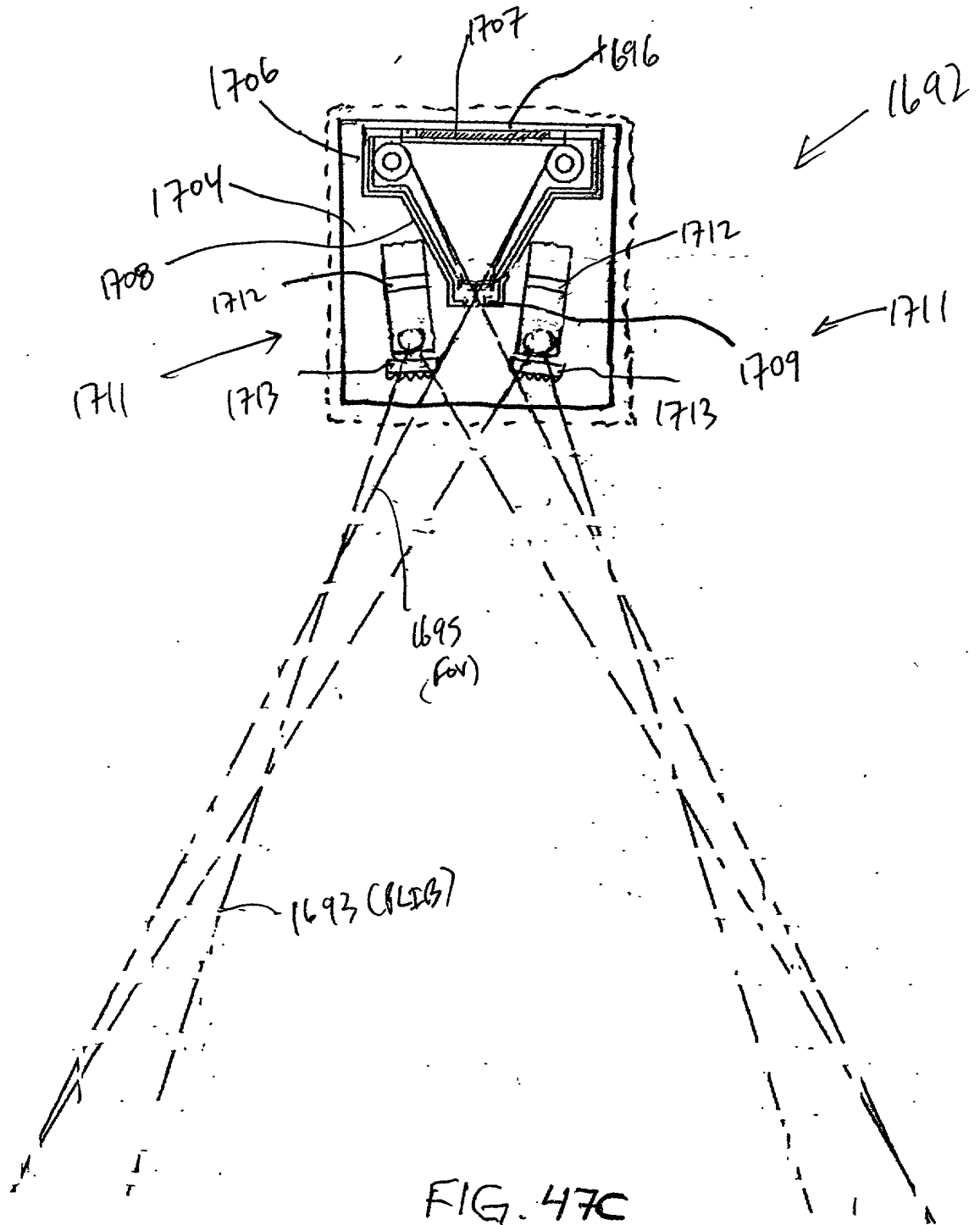


FIG. 47B

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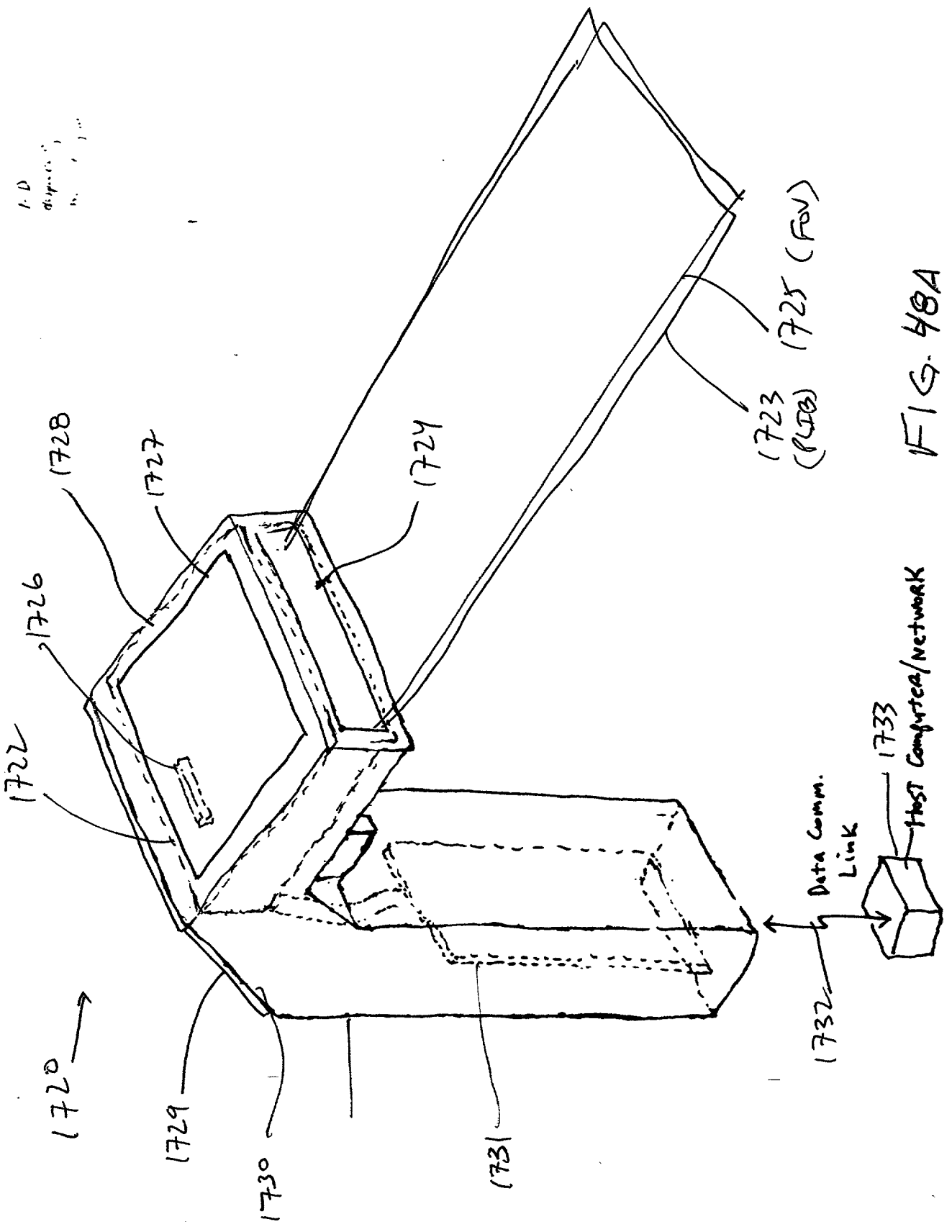


FIG. 48A

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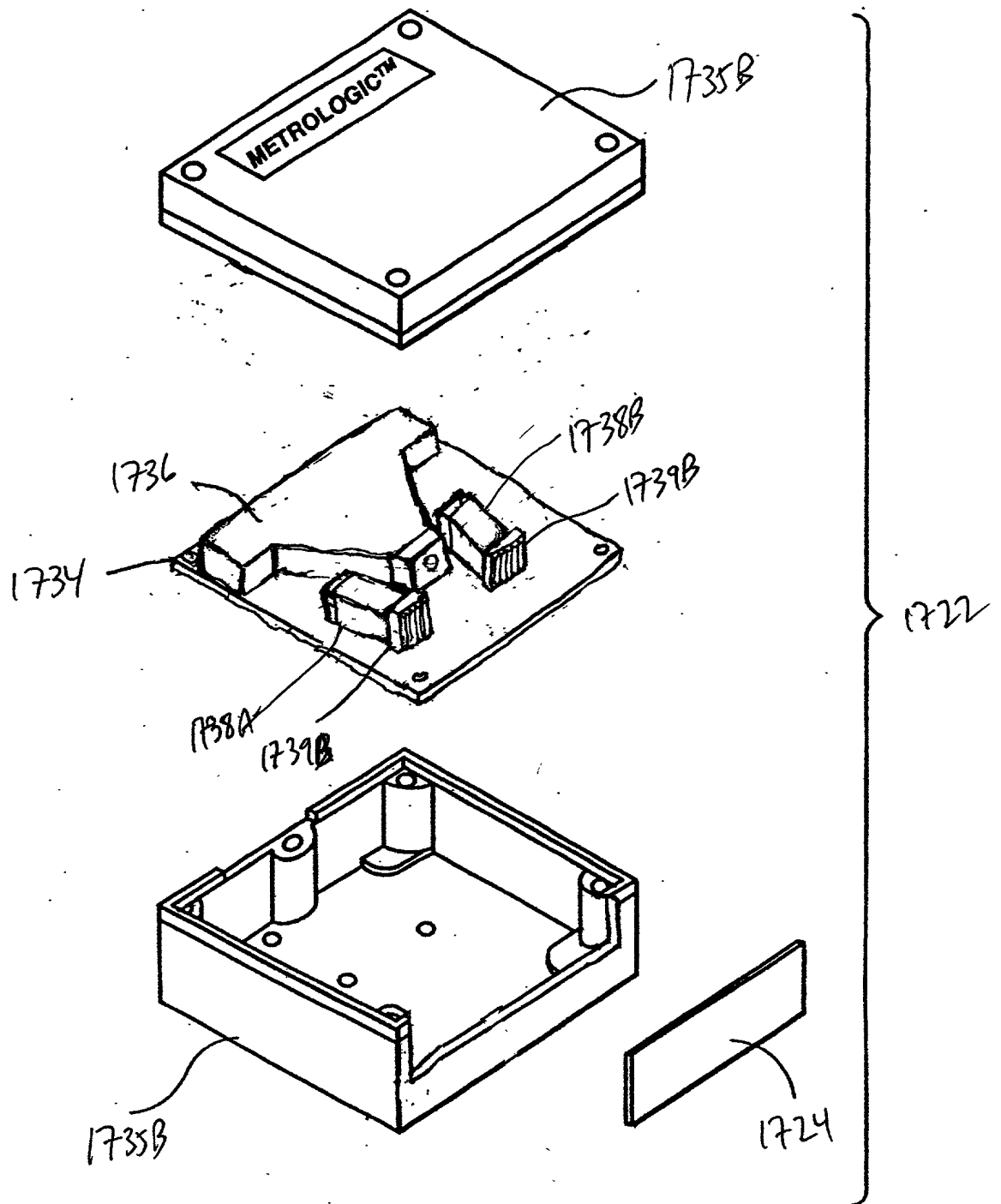


FIG. 48B

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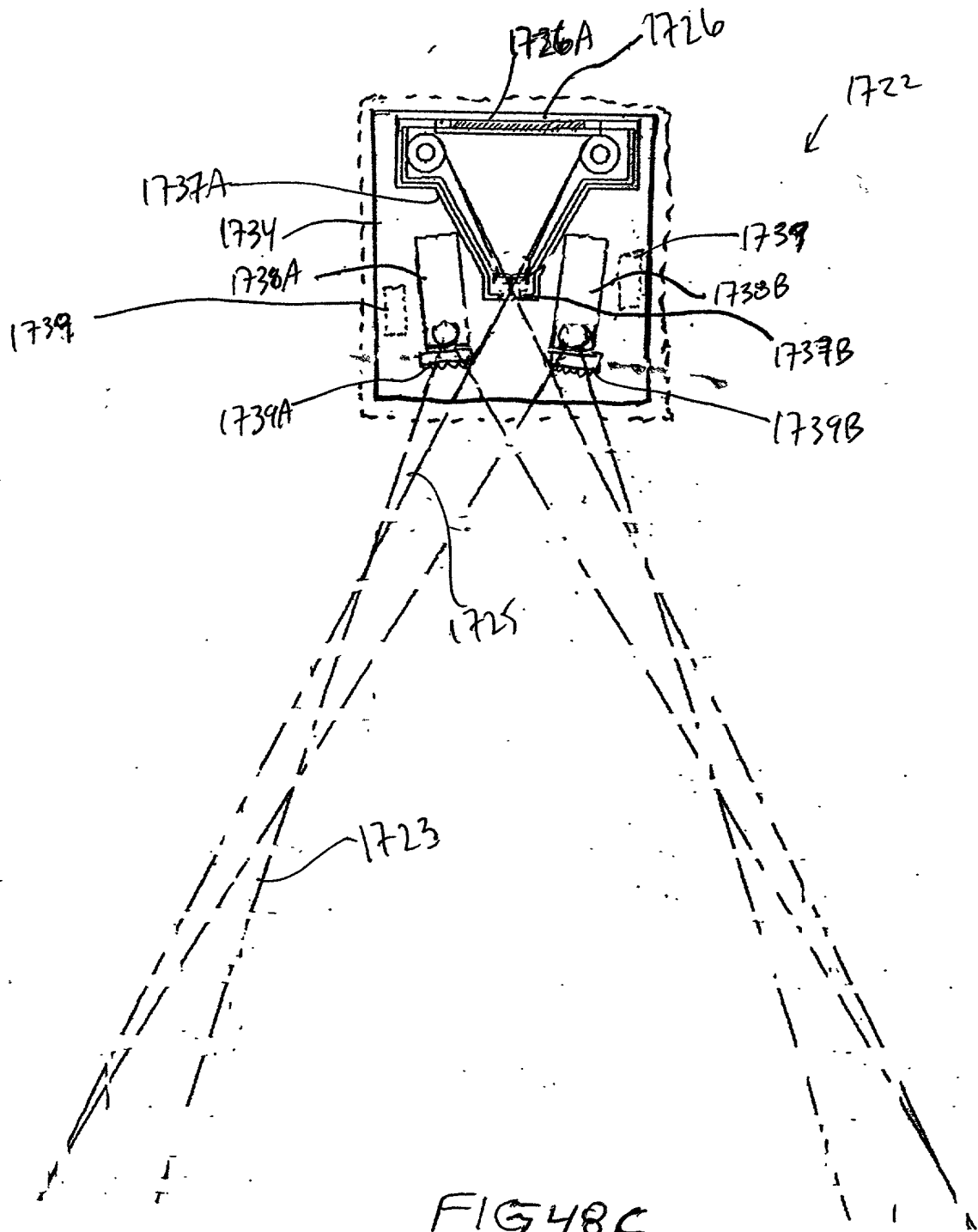


FIG. 48C

10067440 80040

20100207 01123001

1-D
display
...

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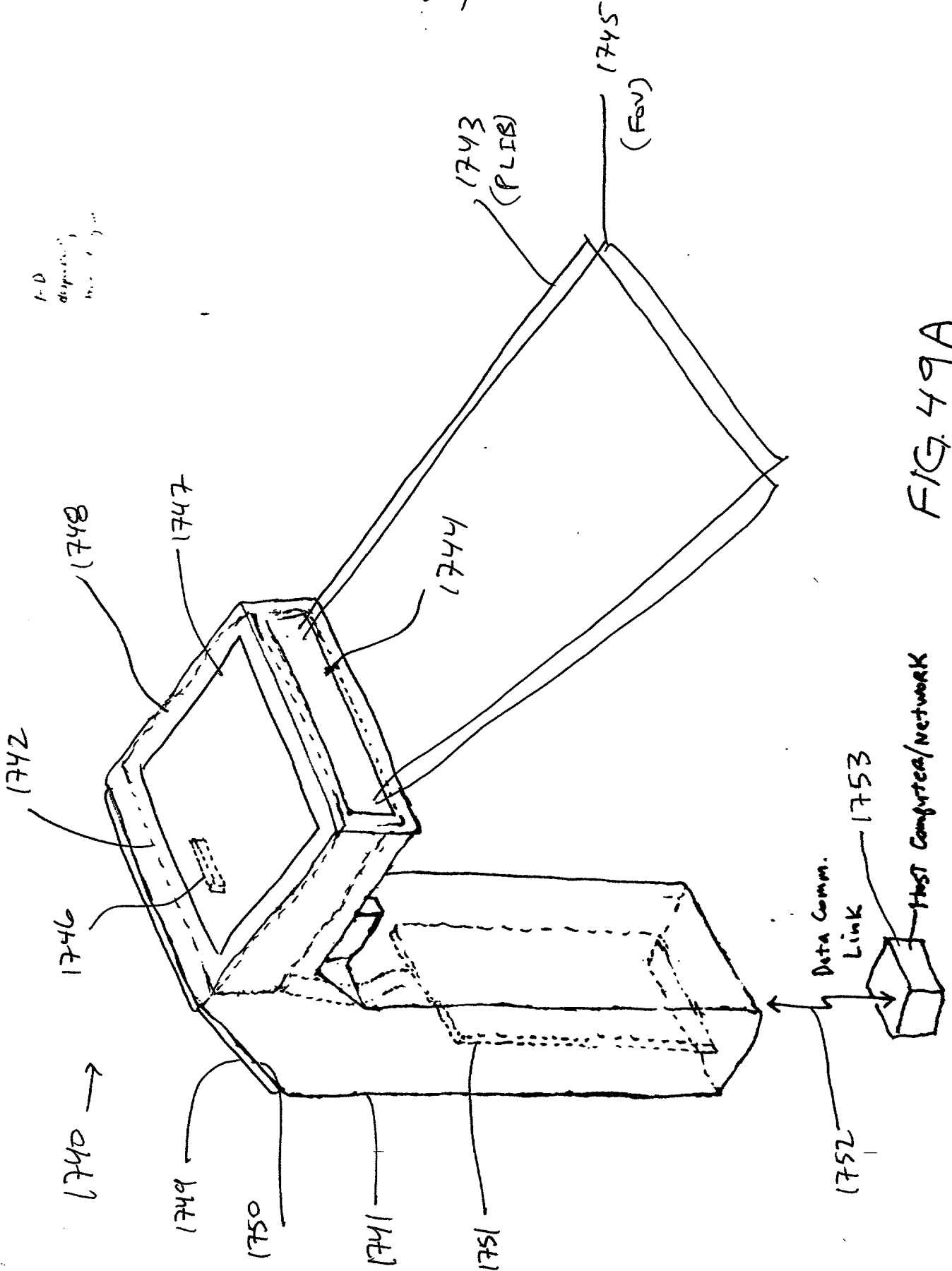


FIG. 49A

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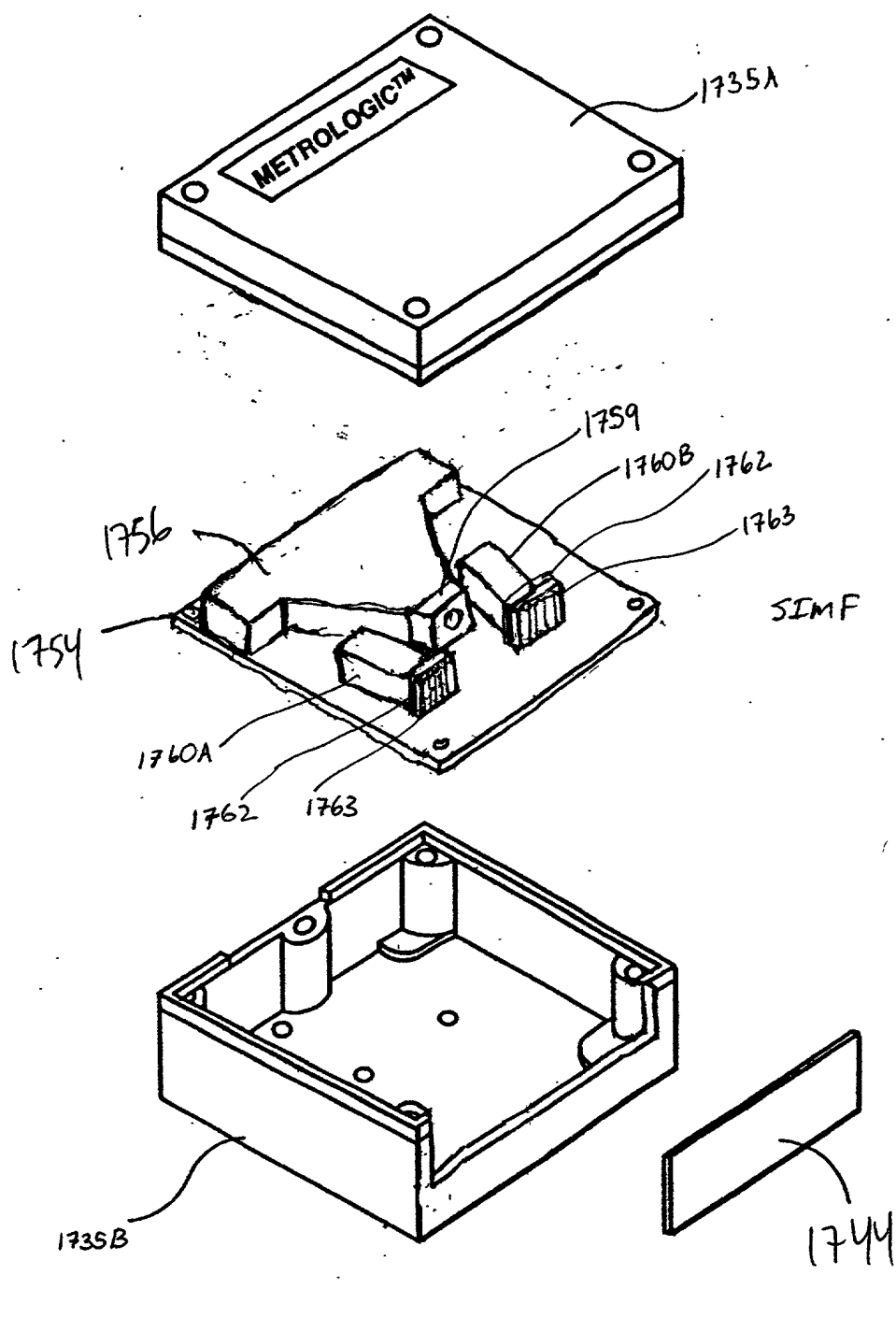


FIG. 49B

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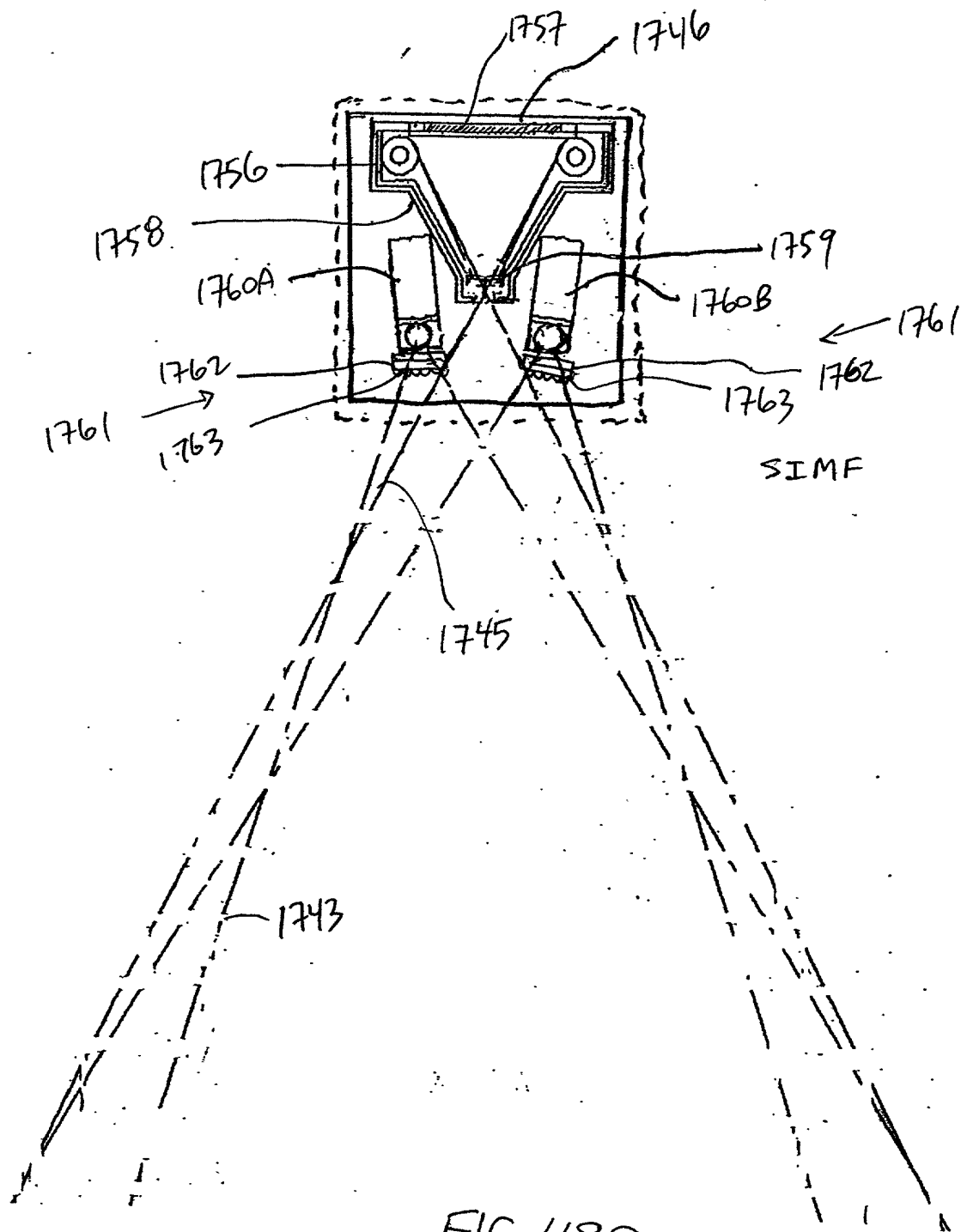
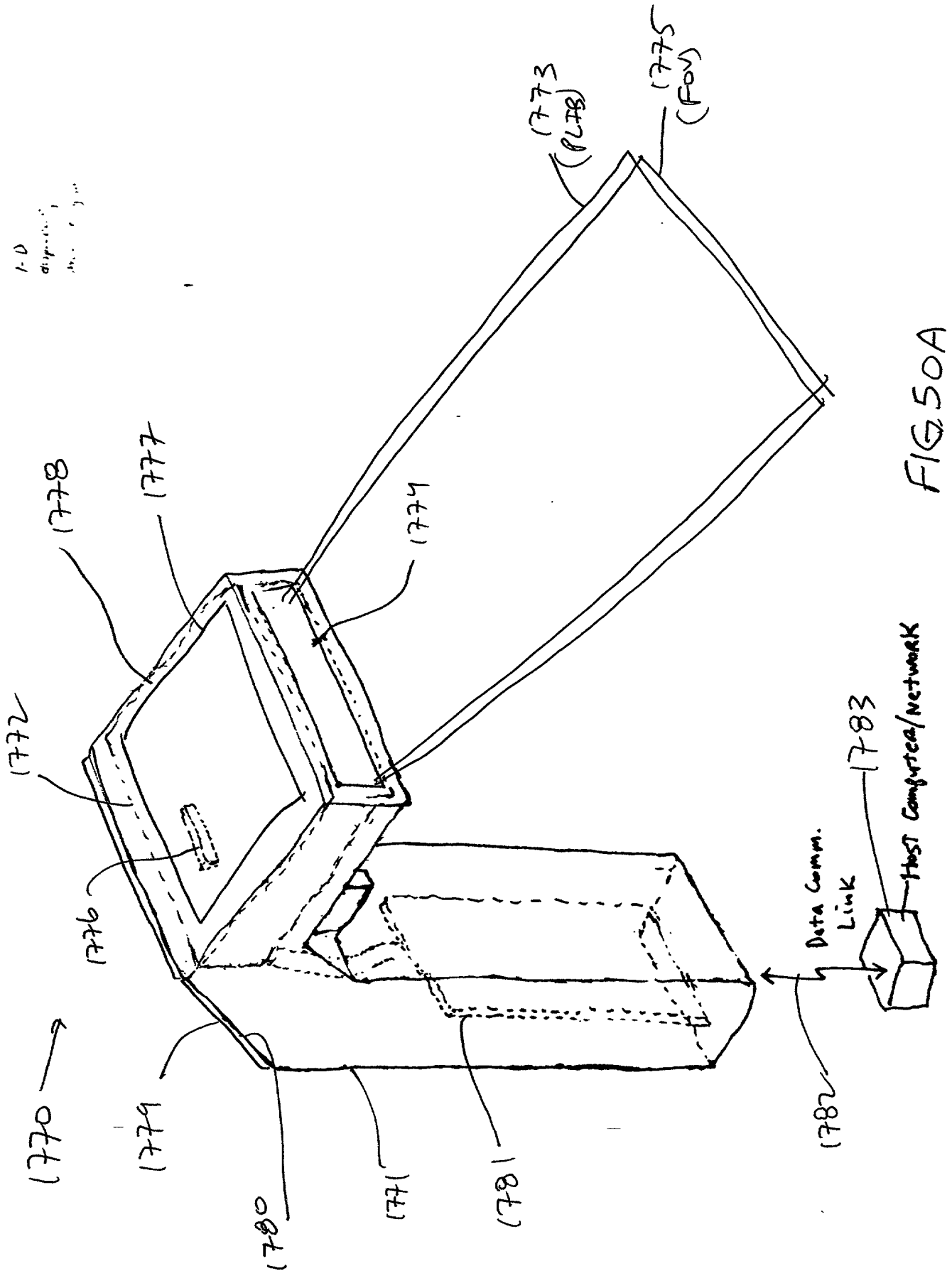


FIG. 49C

1-D
display
...



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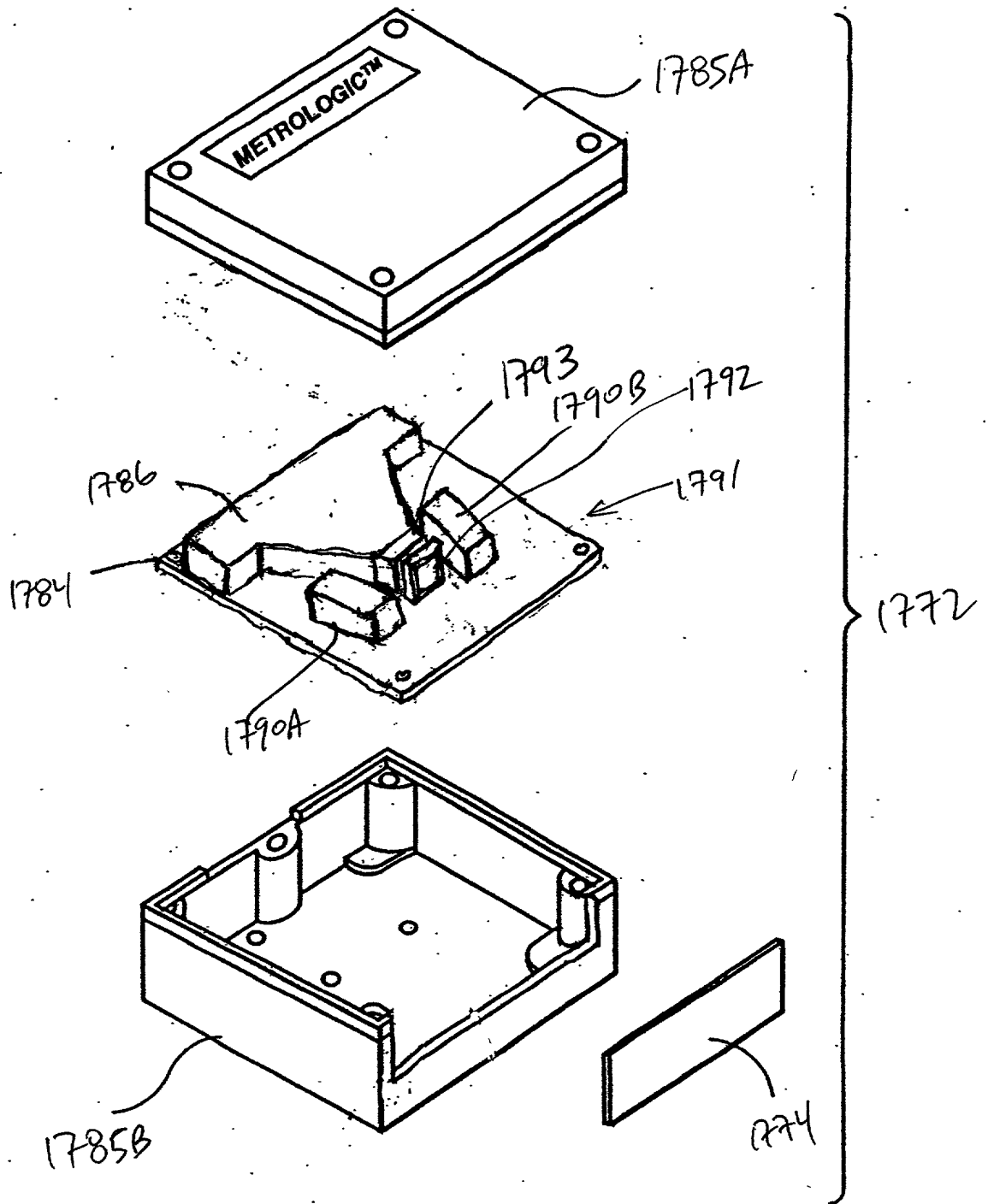


FIG. 50B

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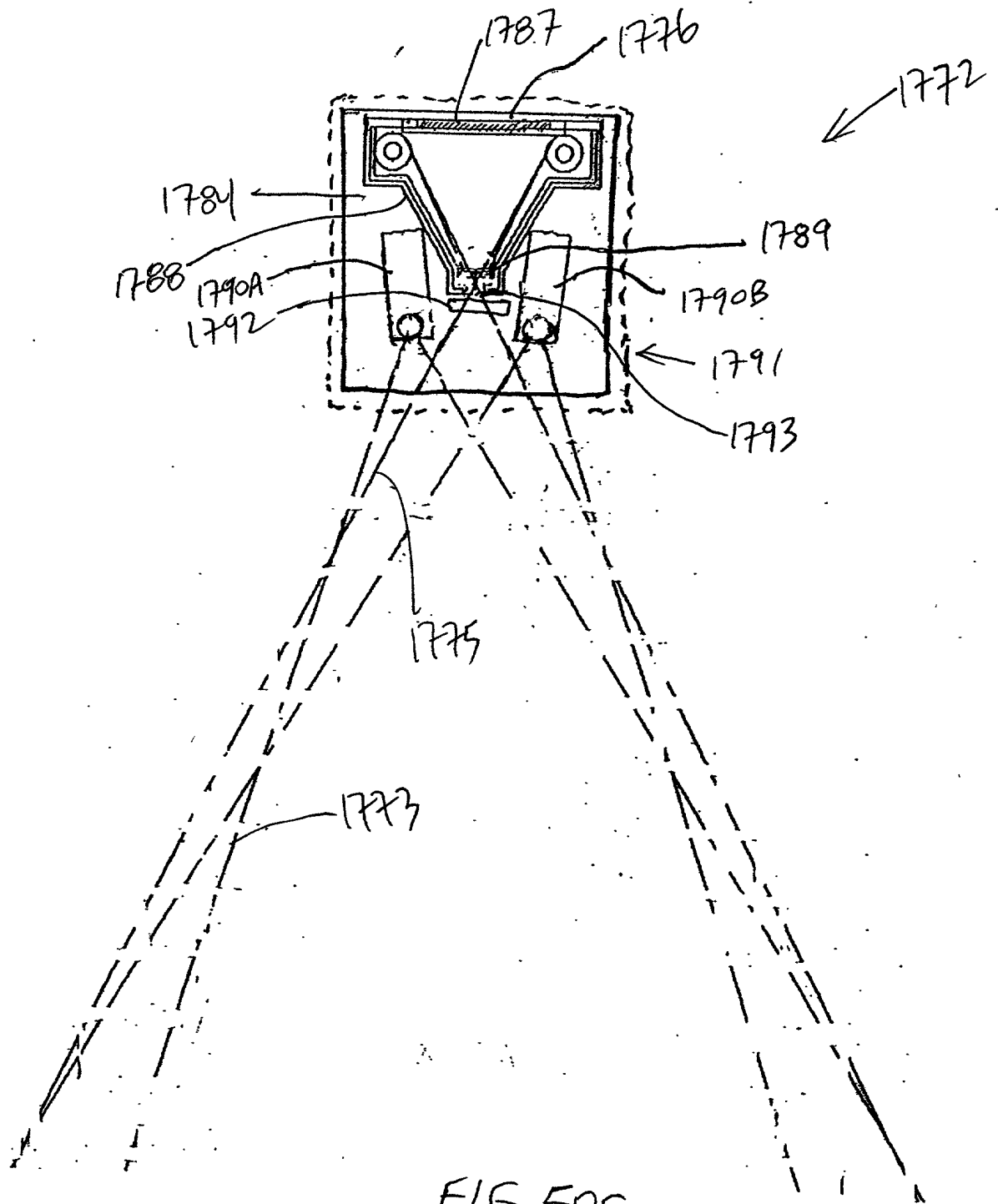
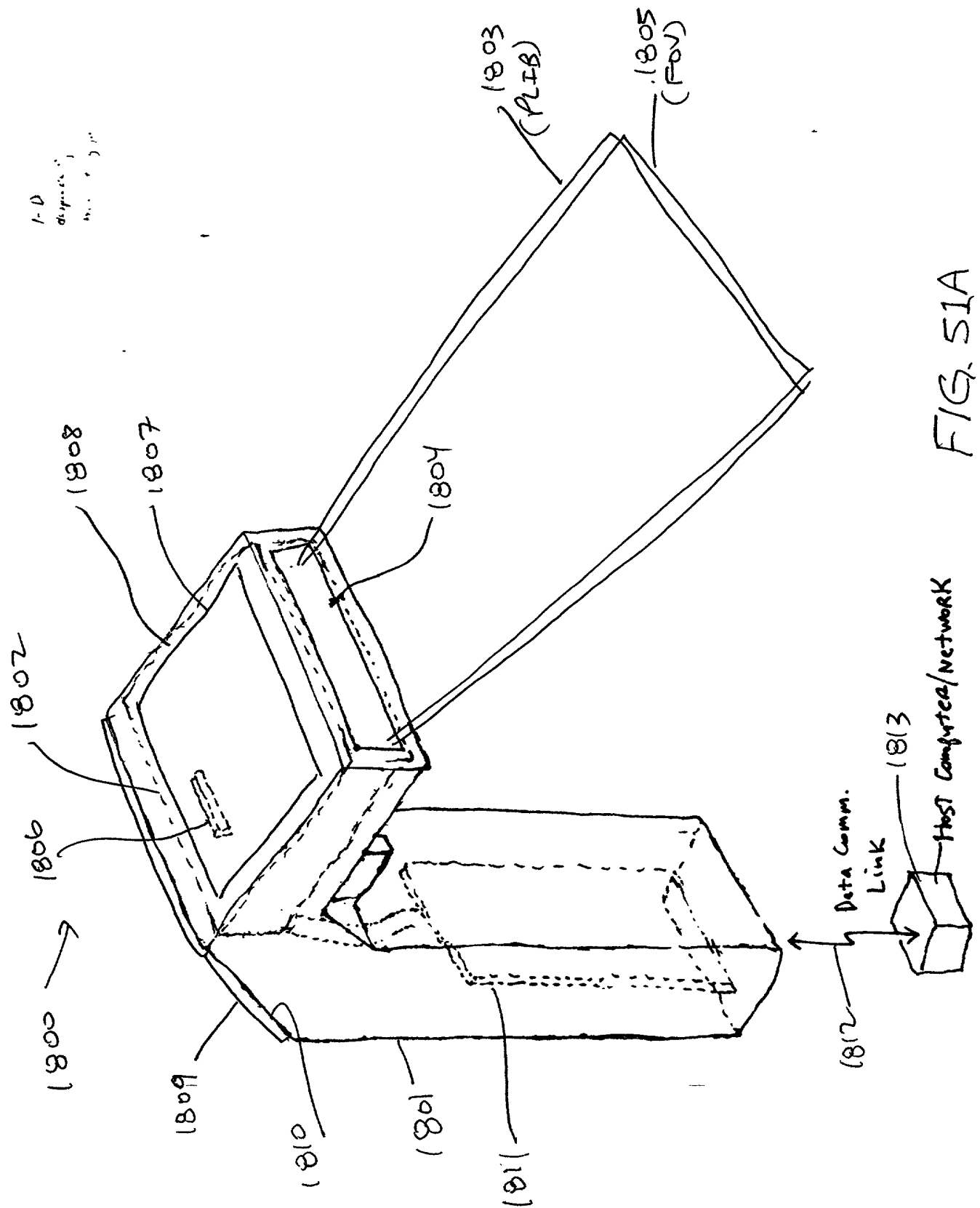


FIG. 50C

201002004745001



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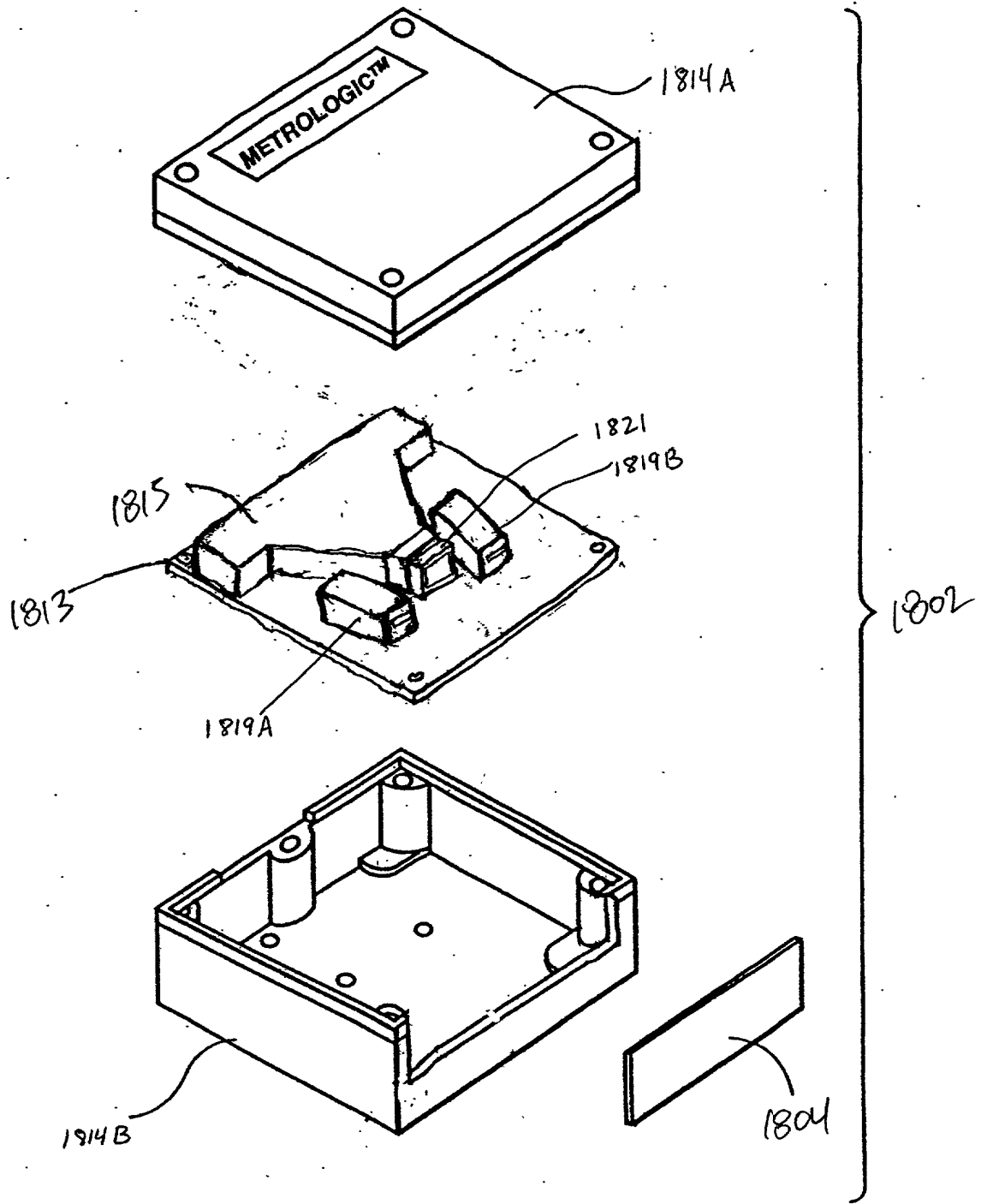
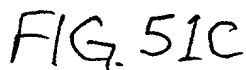


FIG. 51B

[illegible]

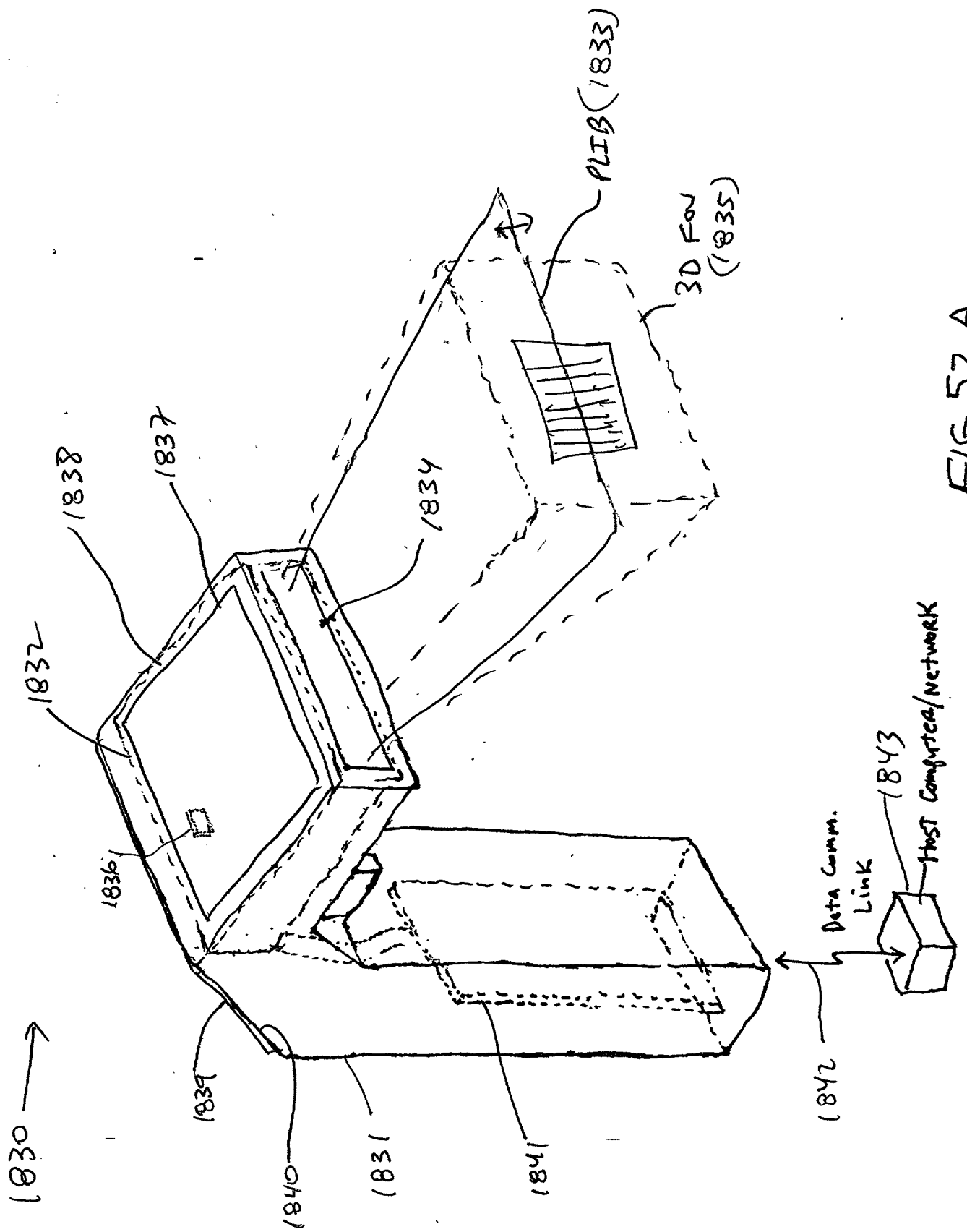


FIG. 52A

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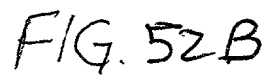


Fig. 1I 3A-3B

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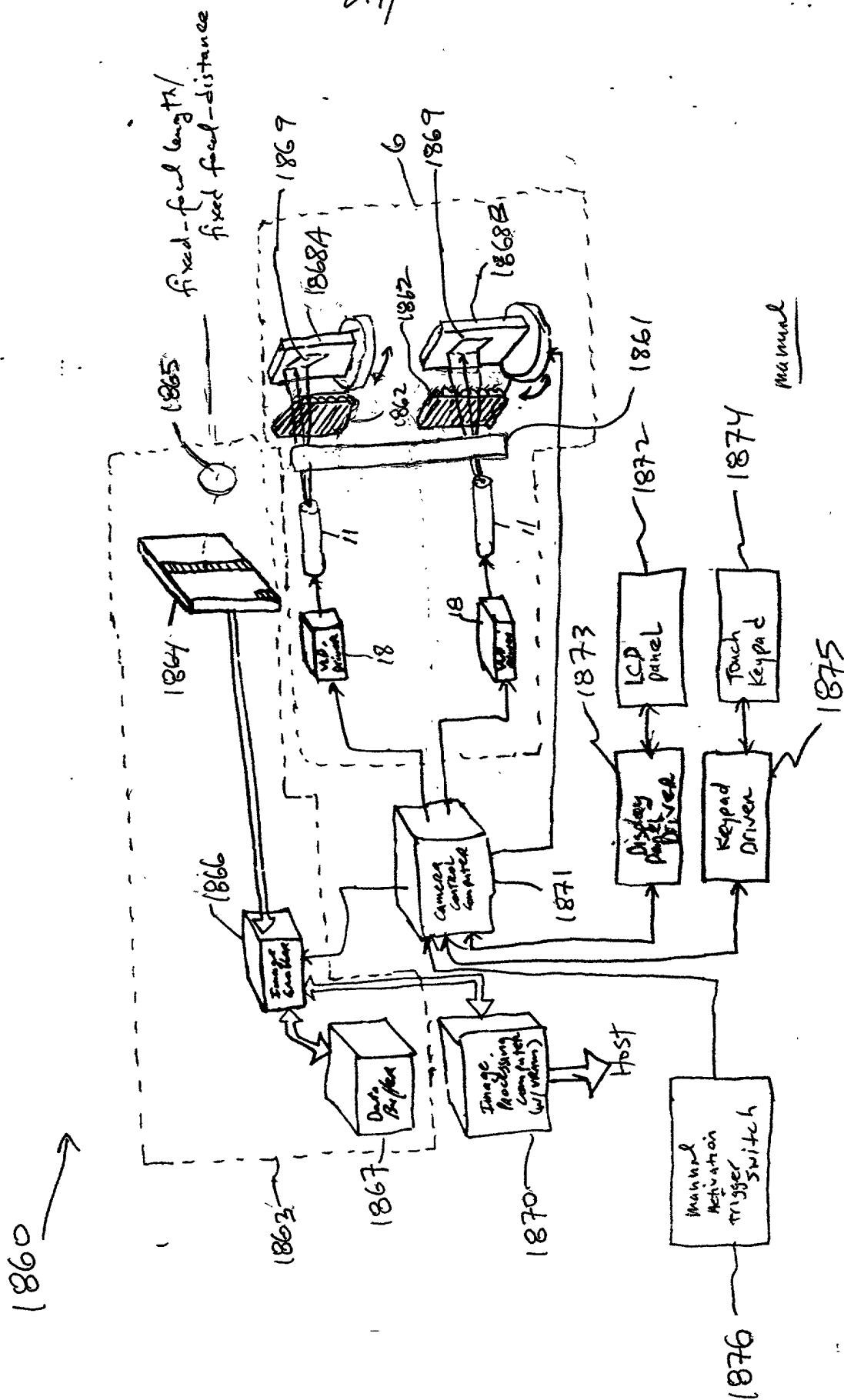


FIG. 53A1

1880

fixed-focal length/
fixed focal-distance



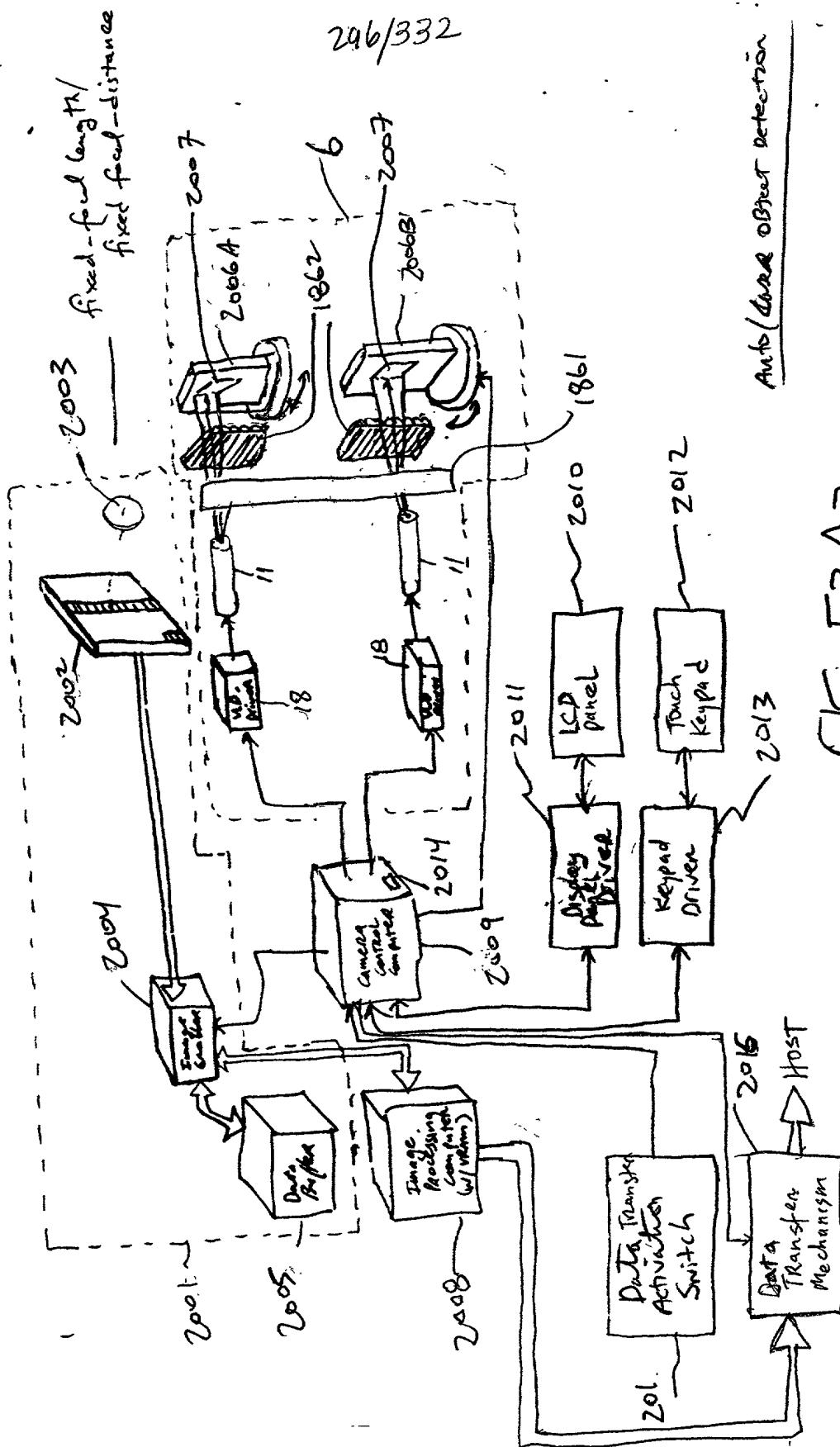
FIG. 53A2

2002

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Auto/data object detection

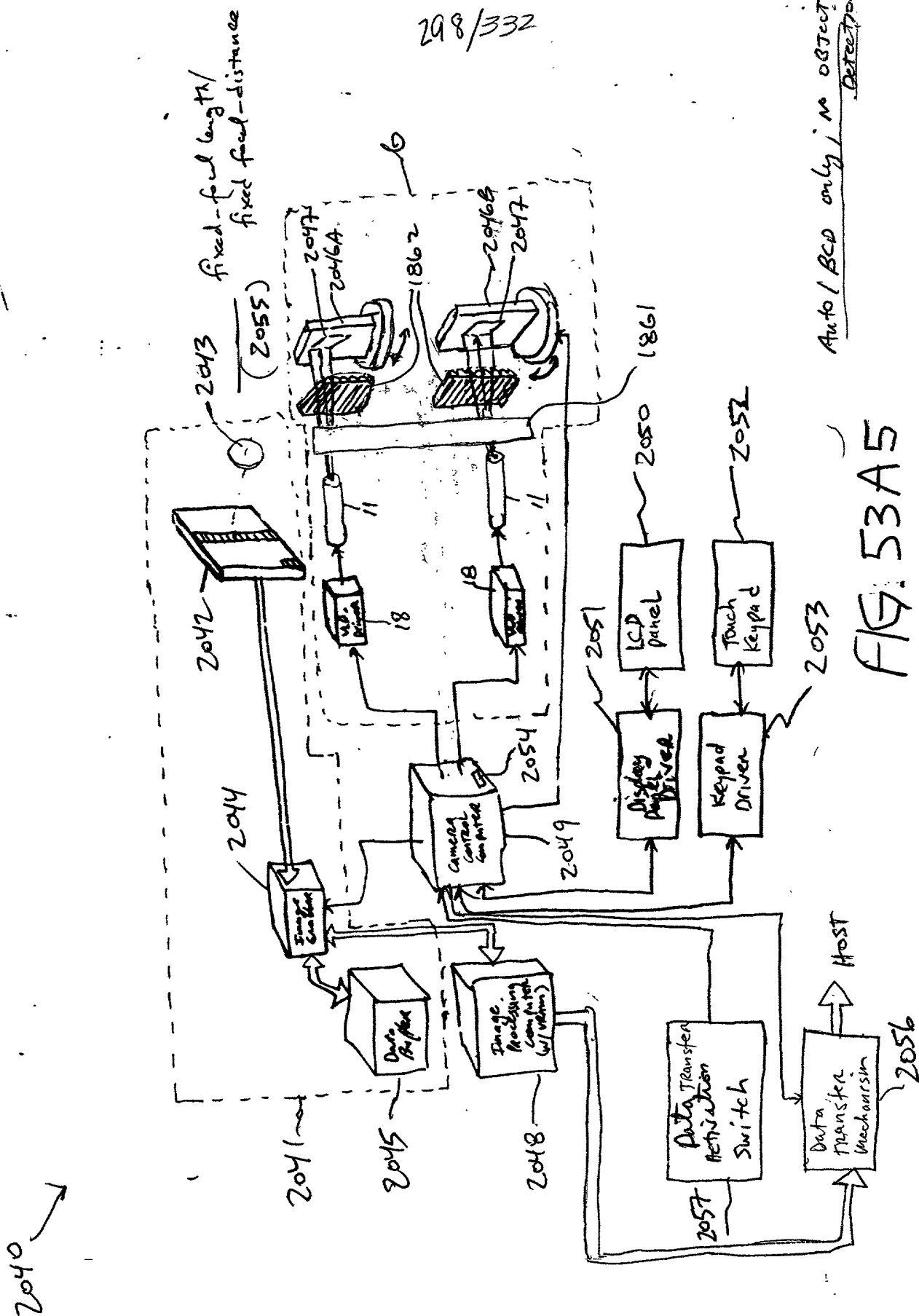
FIG. 53A3



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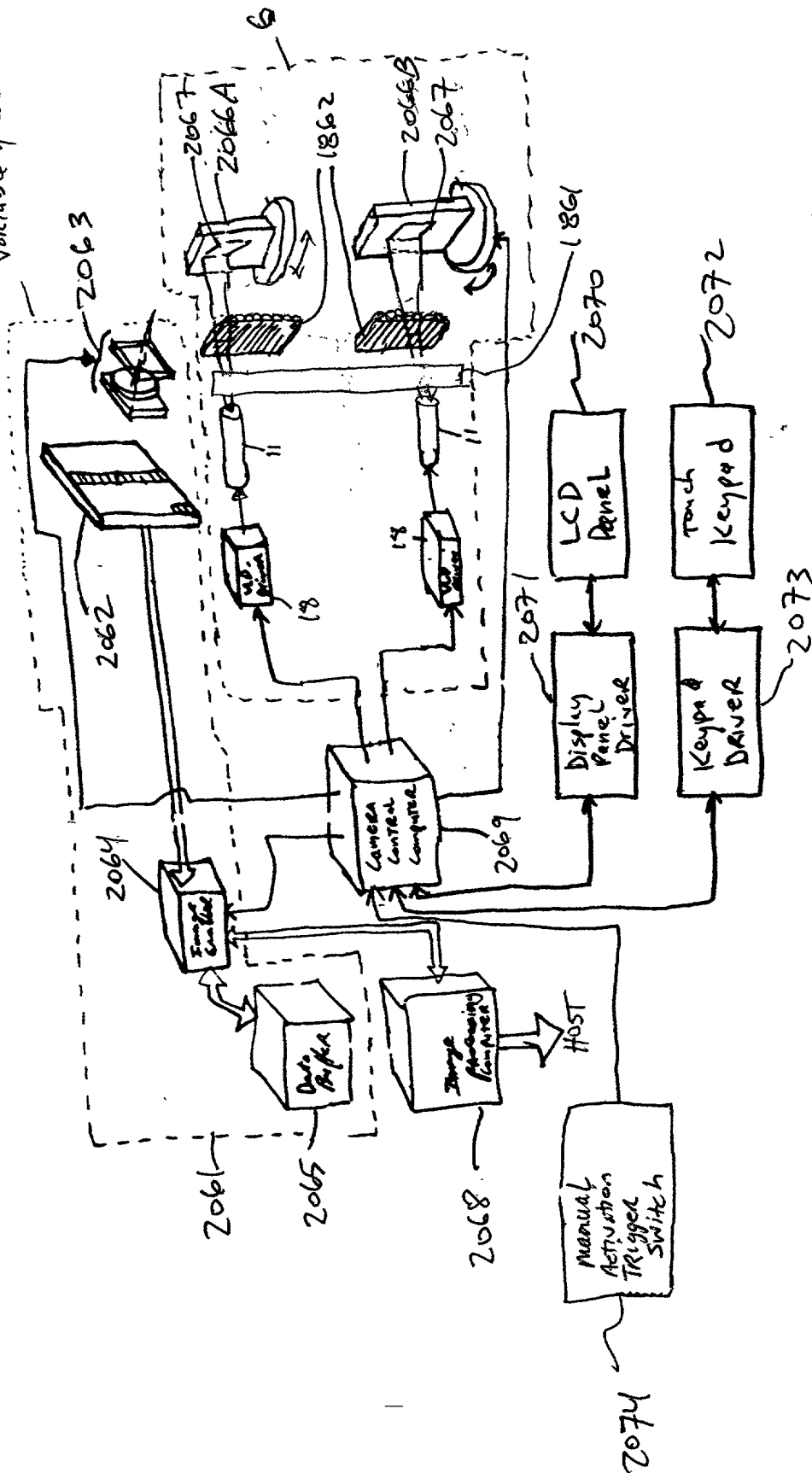
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Auto / BCD only; no object detection.



2060 

fixed focal length /
variable focal distance



Manual

FIG. 53B1

2080 →

fixed focal length/
variable focal distance

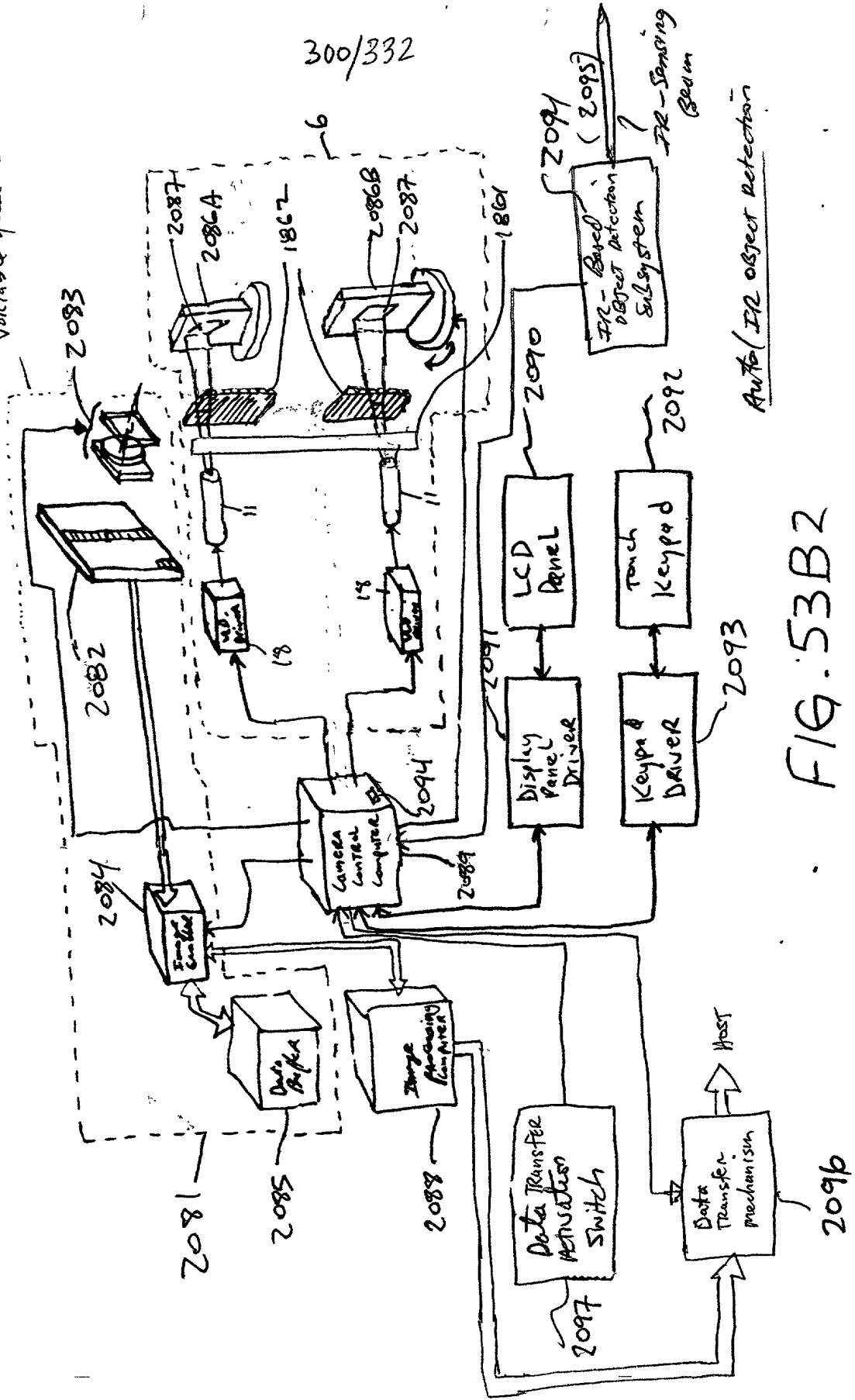
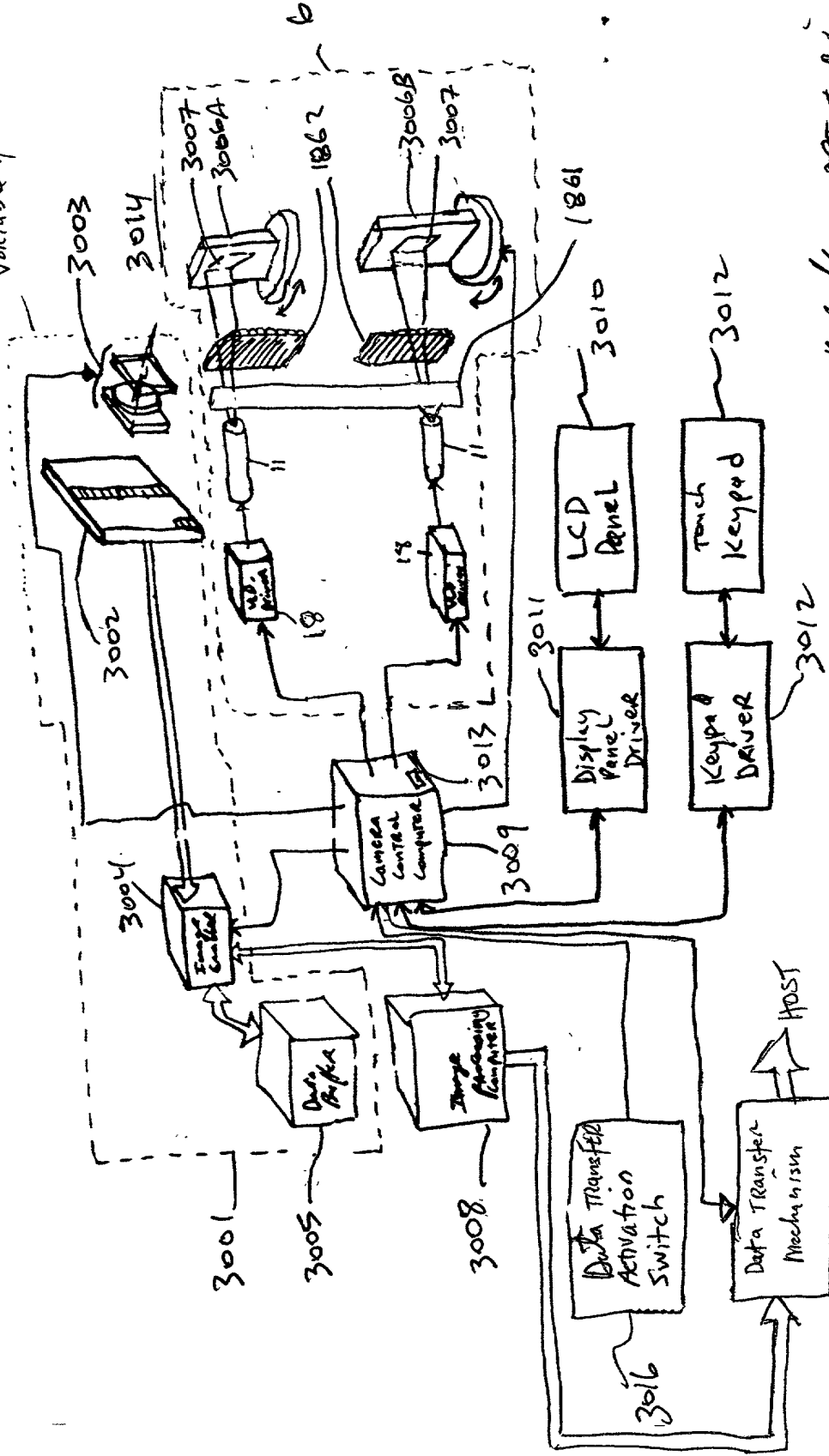


FIG. 53B2

Auto/IR object detection

3000

fixed focal length/
variable focal distance



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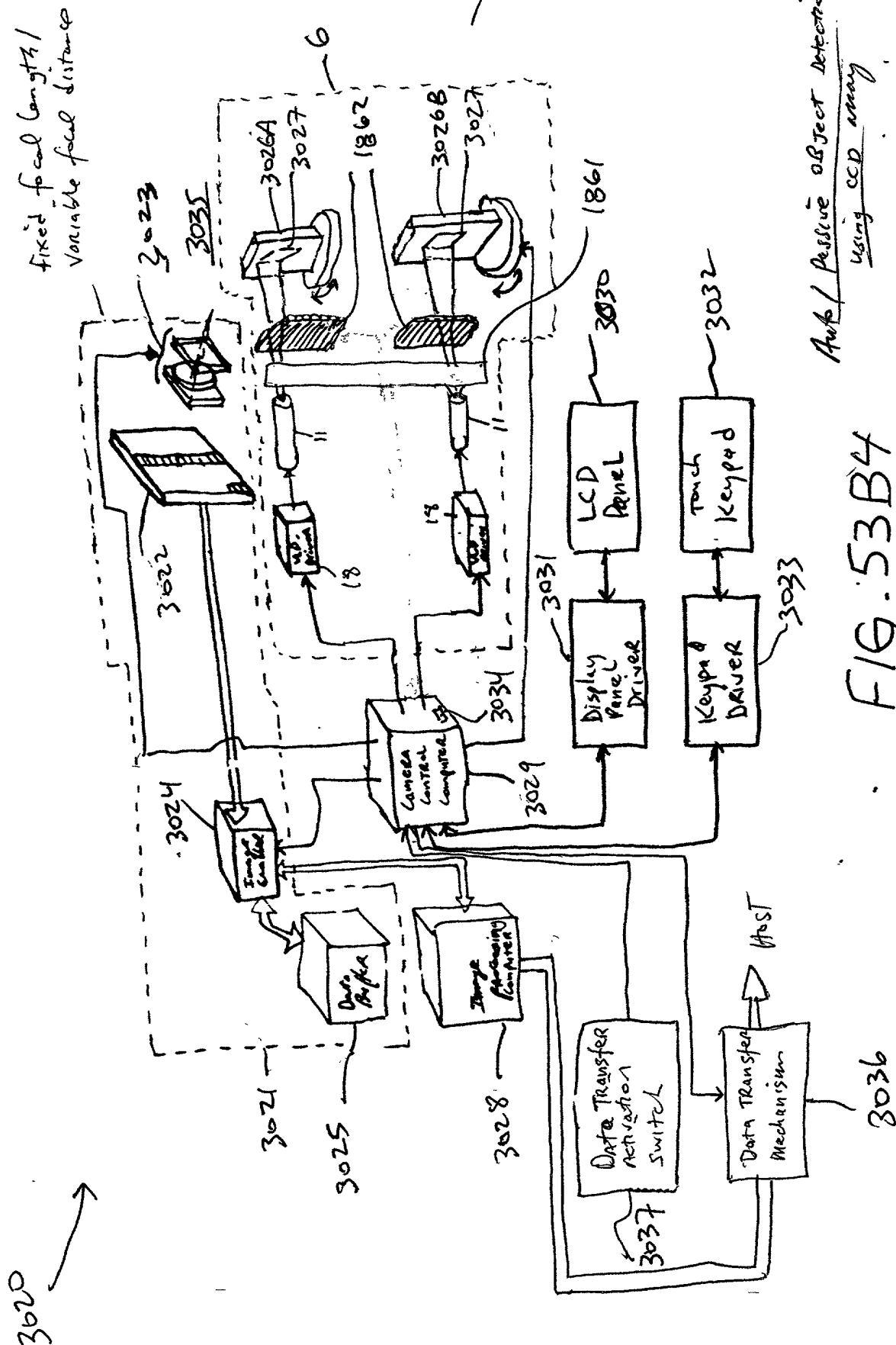
Auto/Clean Object Detection

FIG. 53B3

3015

[illegible]

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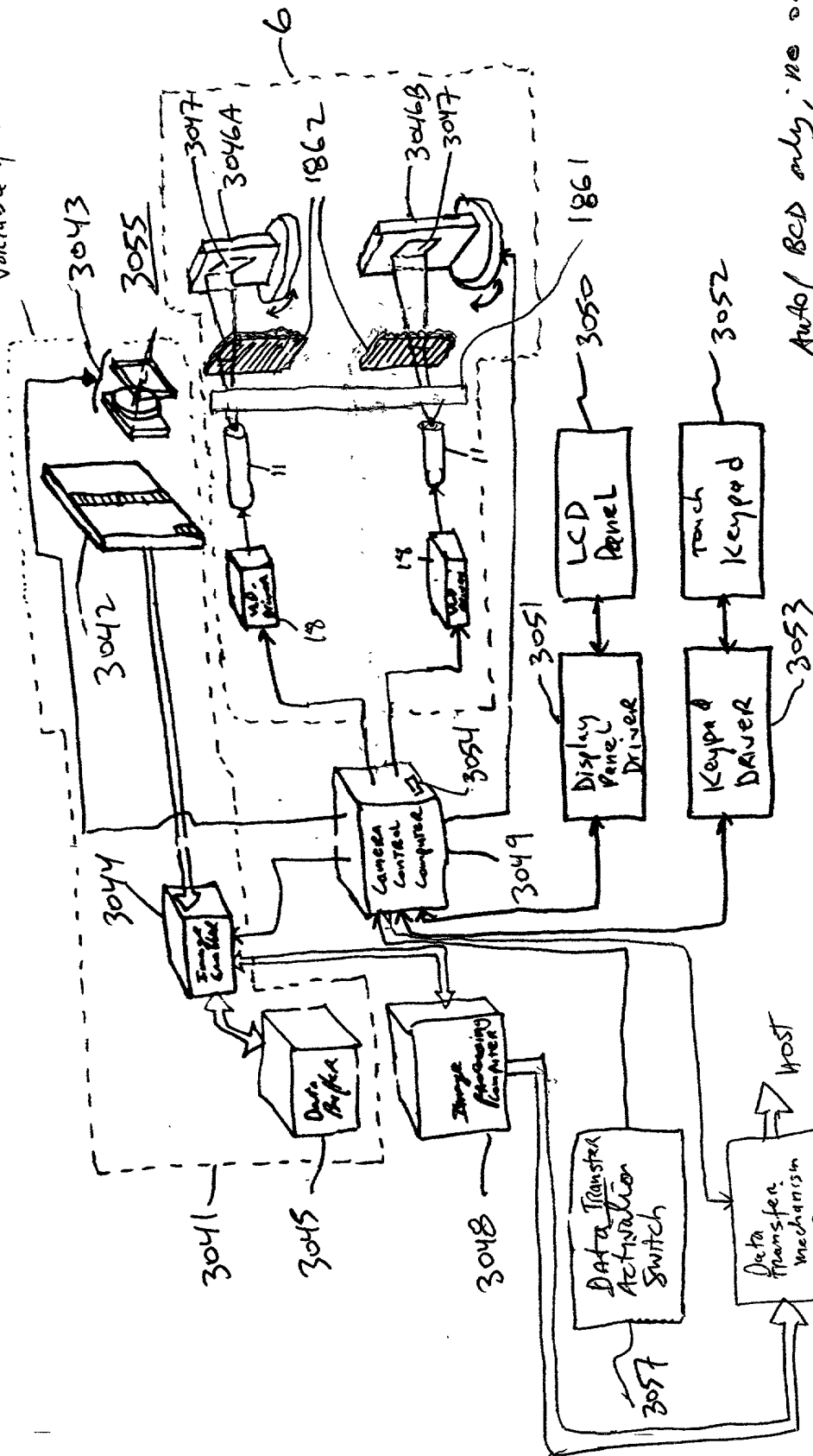
Auto / Passive Object Detection
using CCD array

F16:53B4

3036

← 3000

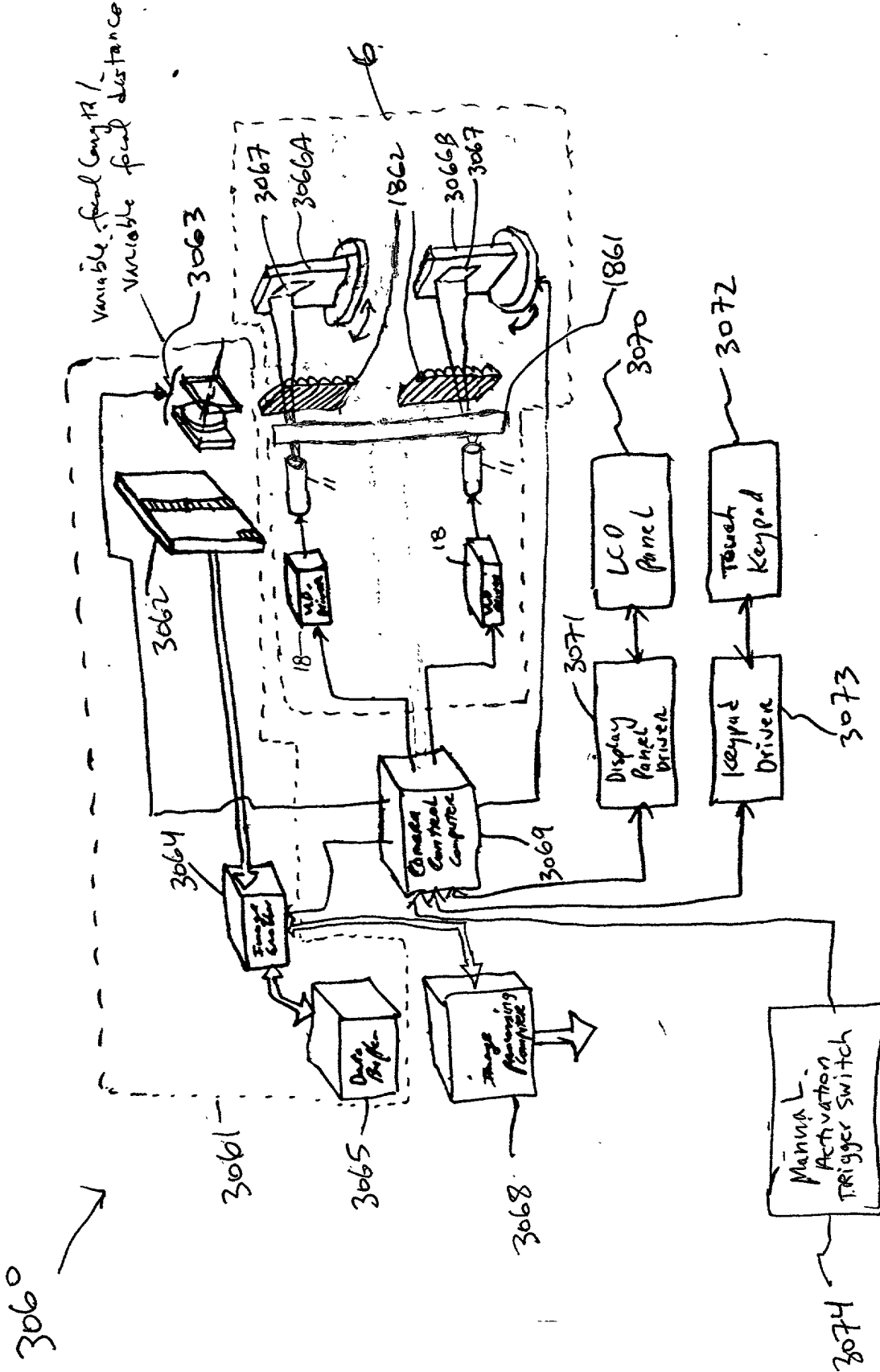
fixed focal length /
variable focal distance



Auto / BCD only, no BJECT
Detection

FIG. 53B5

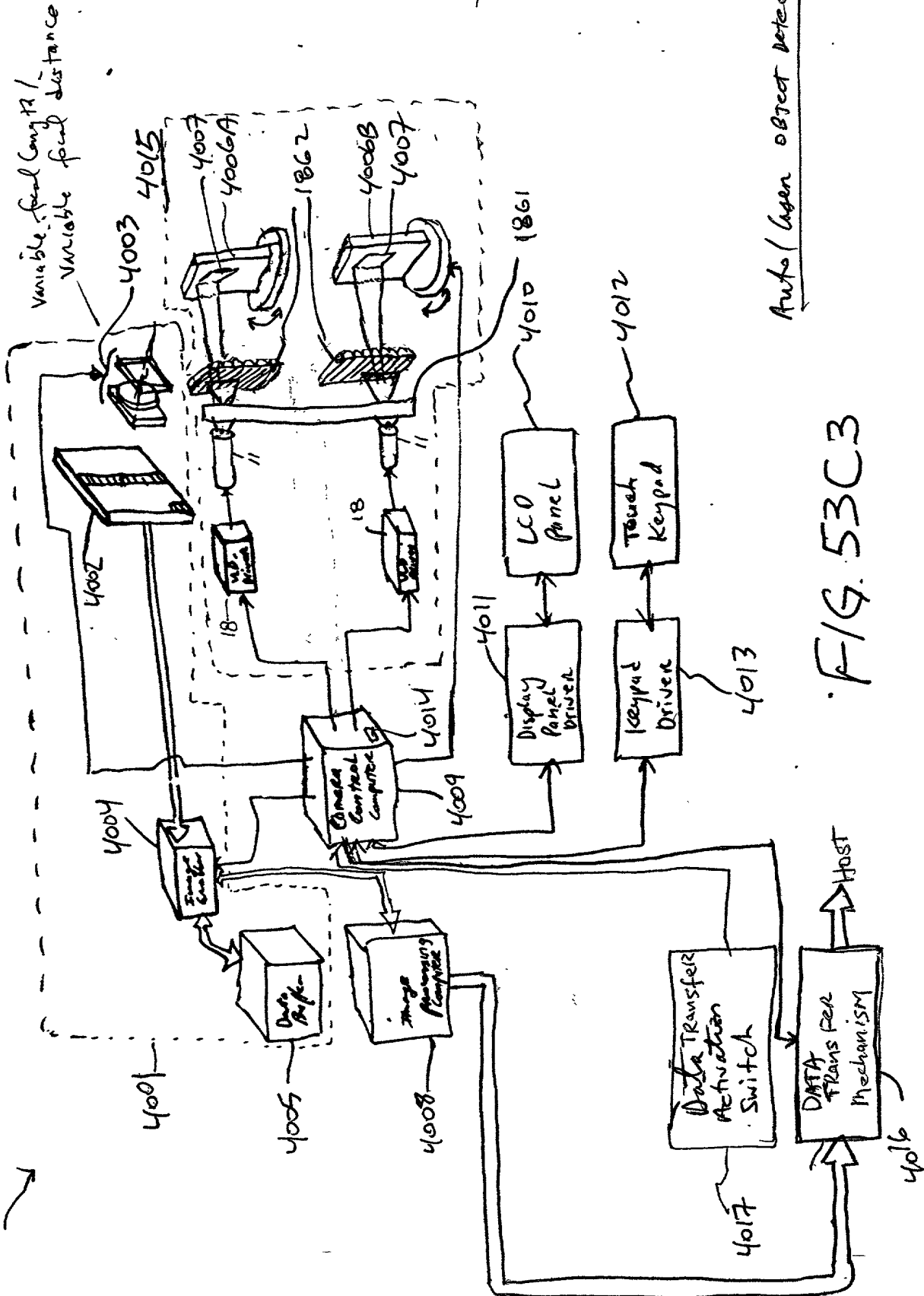
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Manual

FIG. 53C1

4001



Auto / User object detection

FIG. 53C3

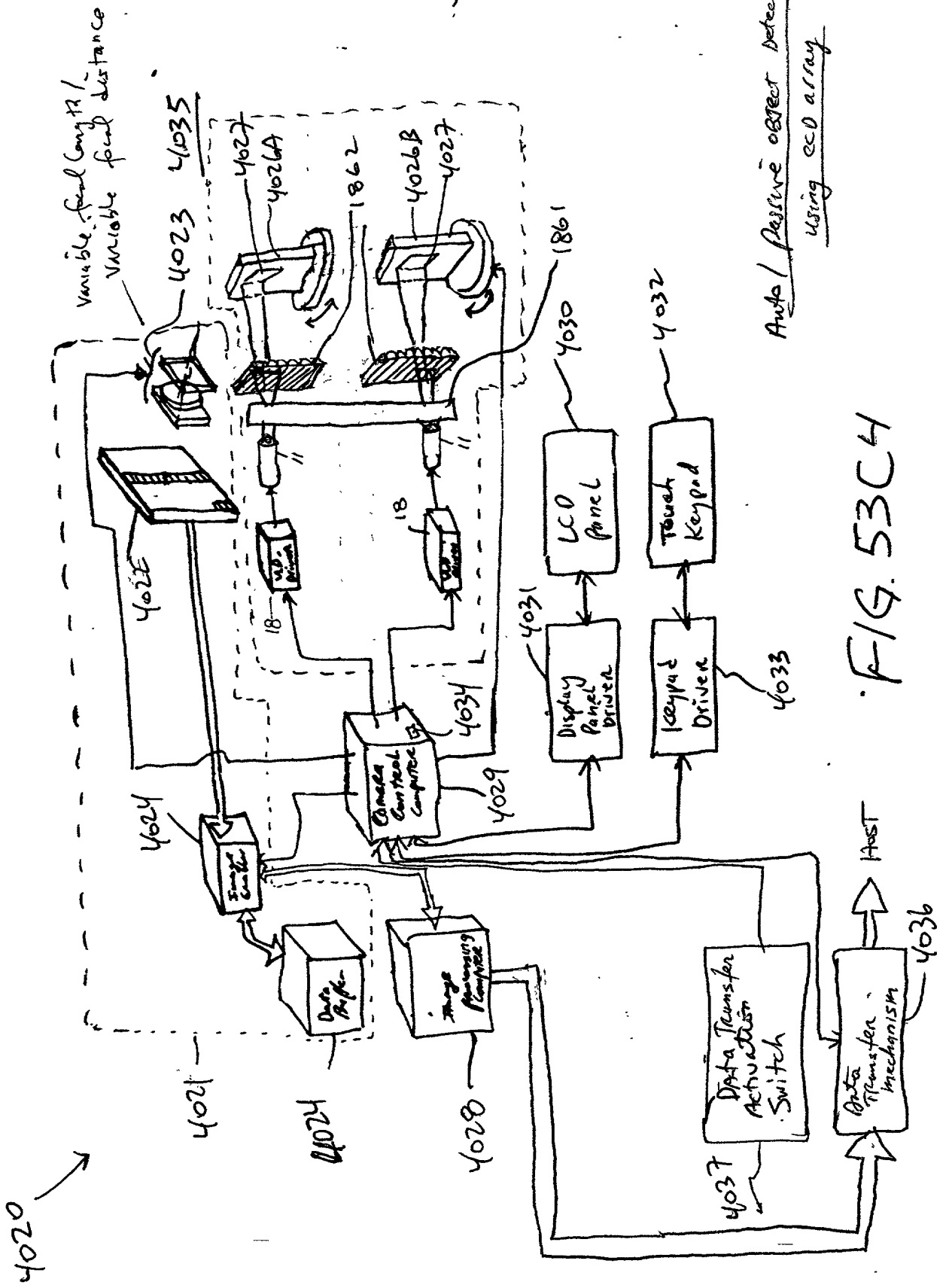
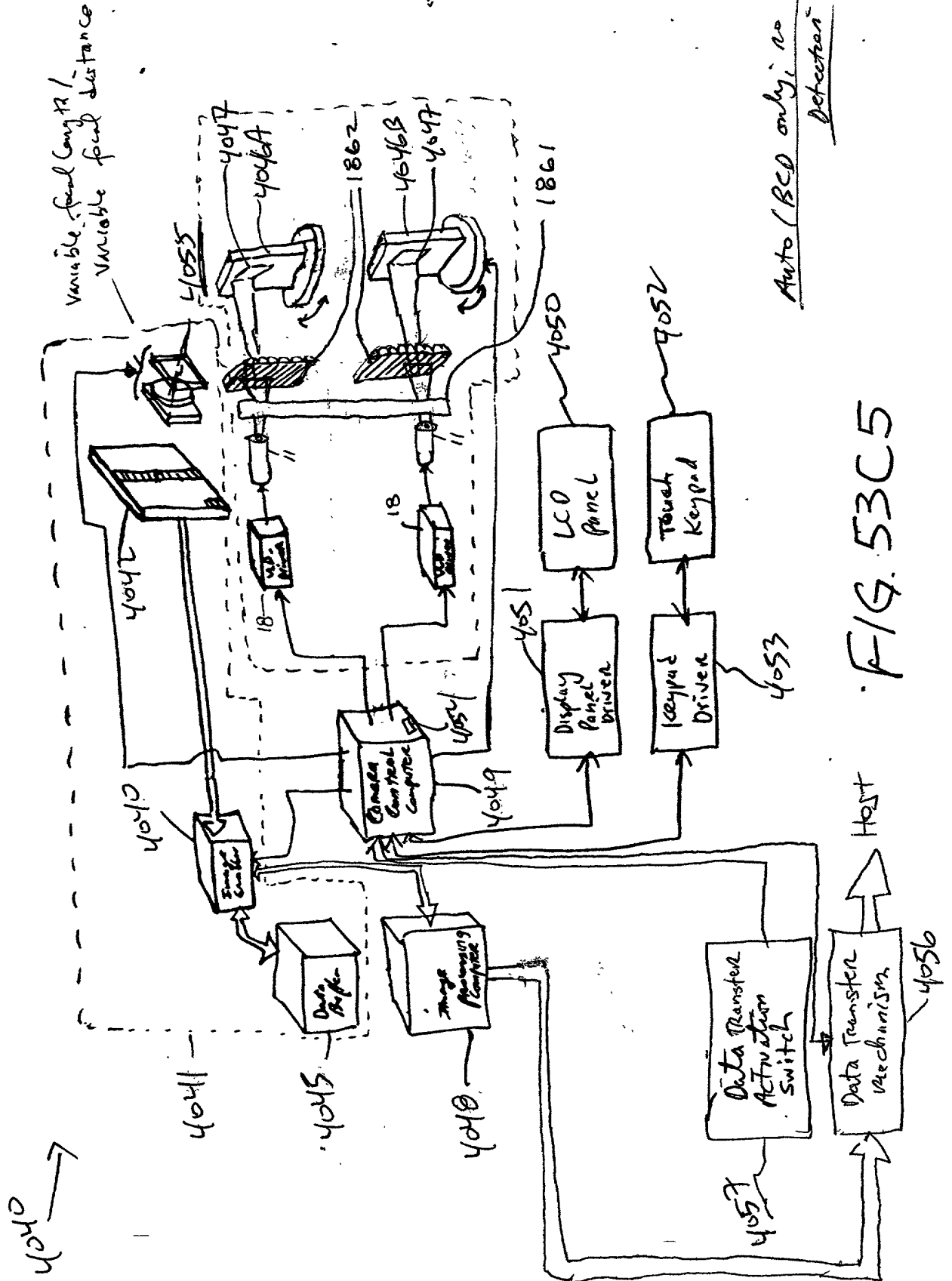


FIG. 53C4

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Auto (BCD only) no object
detection

FIG. 53C5

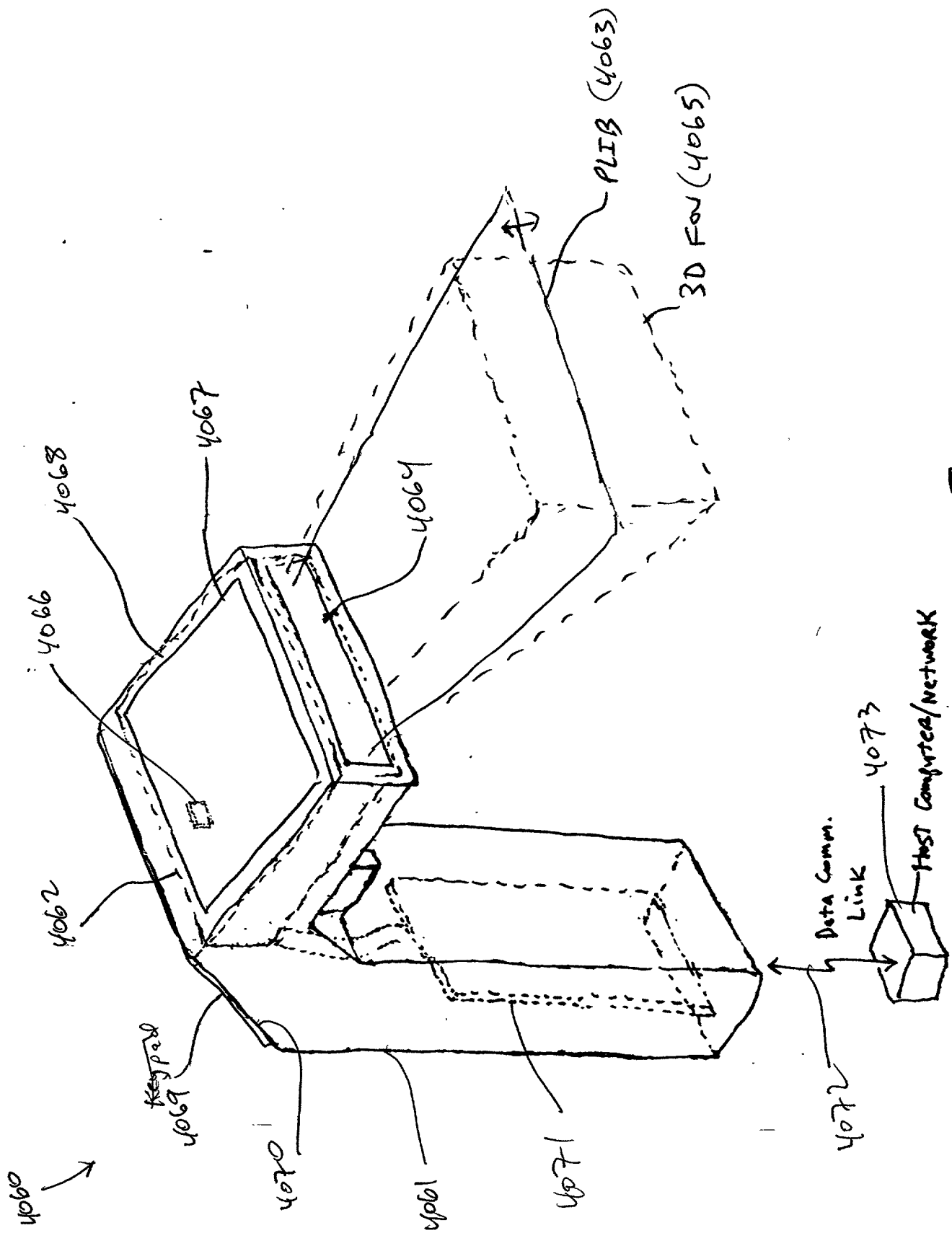


FIG. 54A

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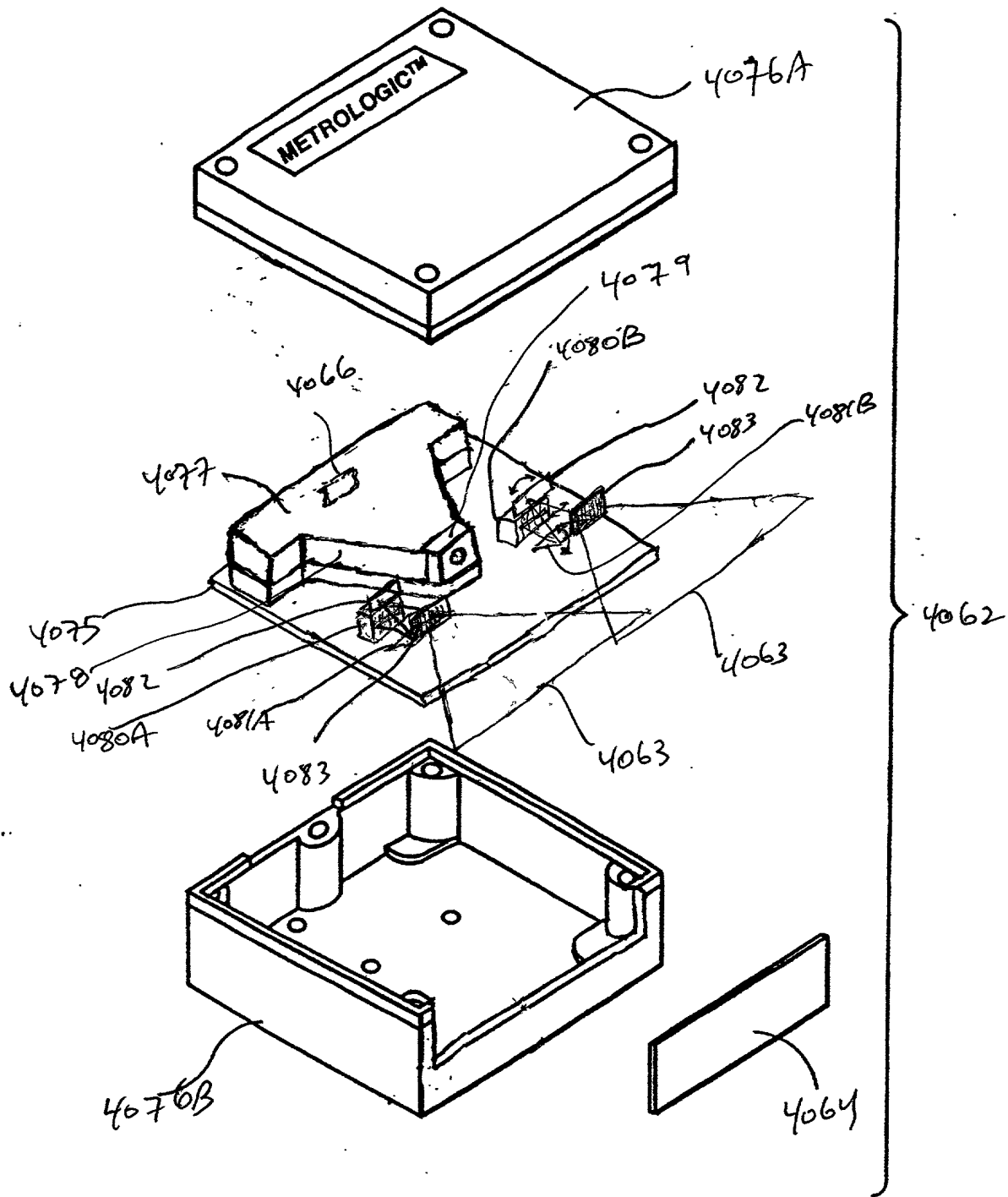


FIG. 54B

(Dual mirrors)

Fig. 1F5A-SP1

2010-01-20

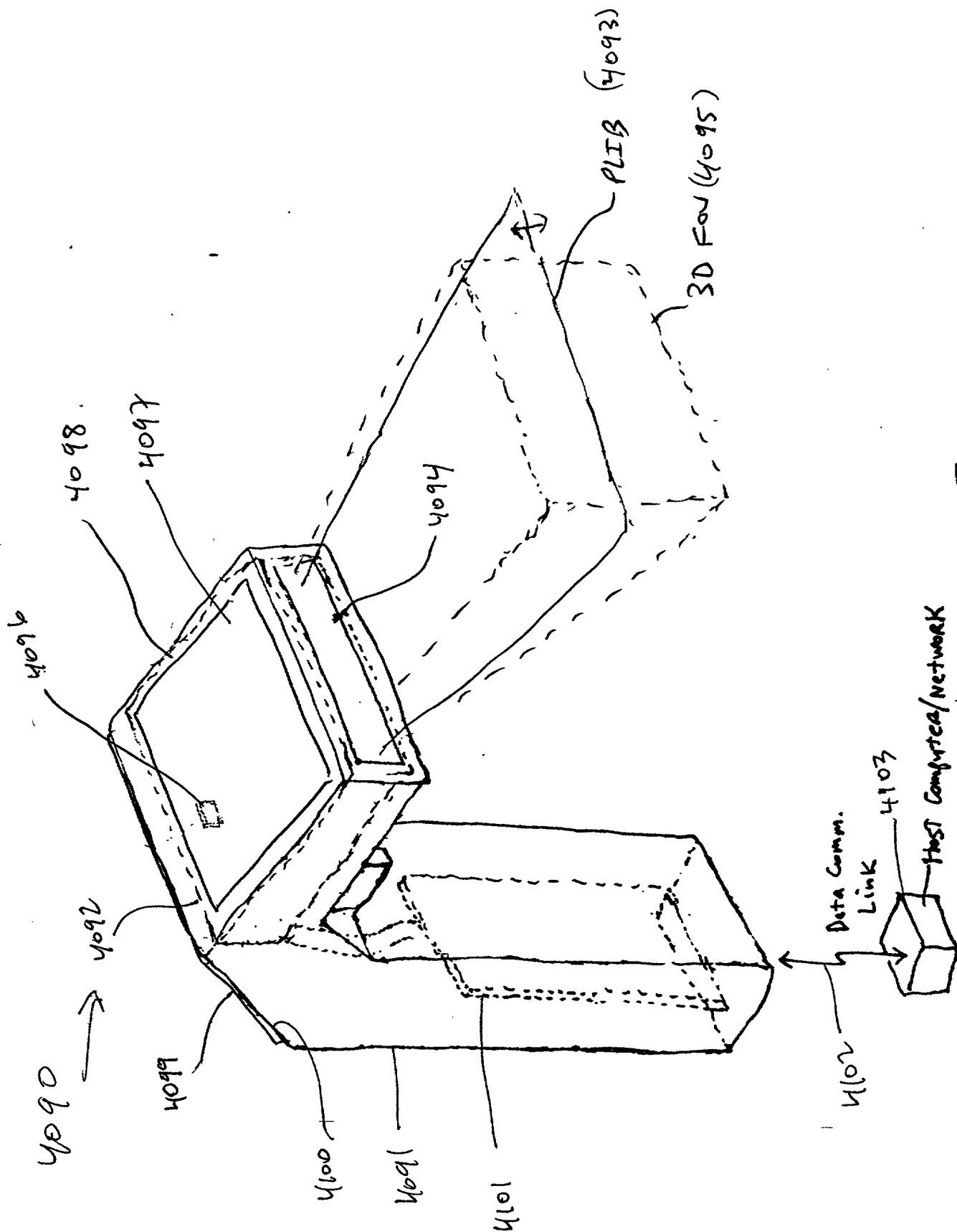


FIG. 55A

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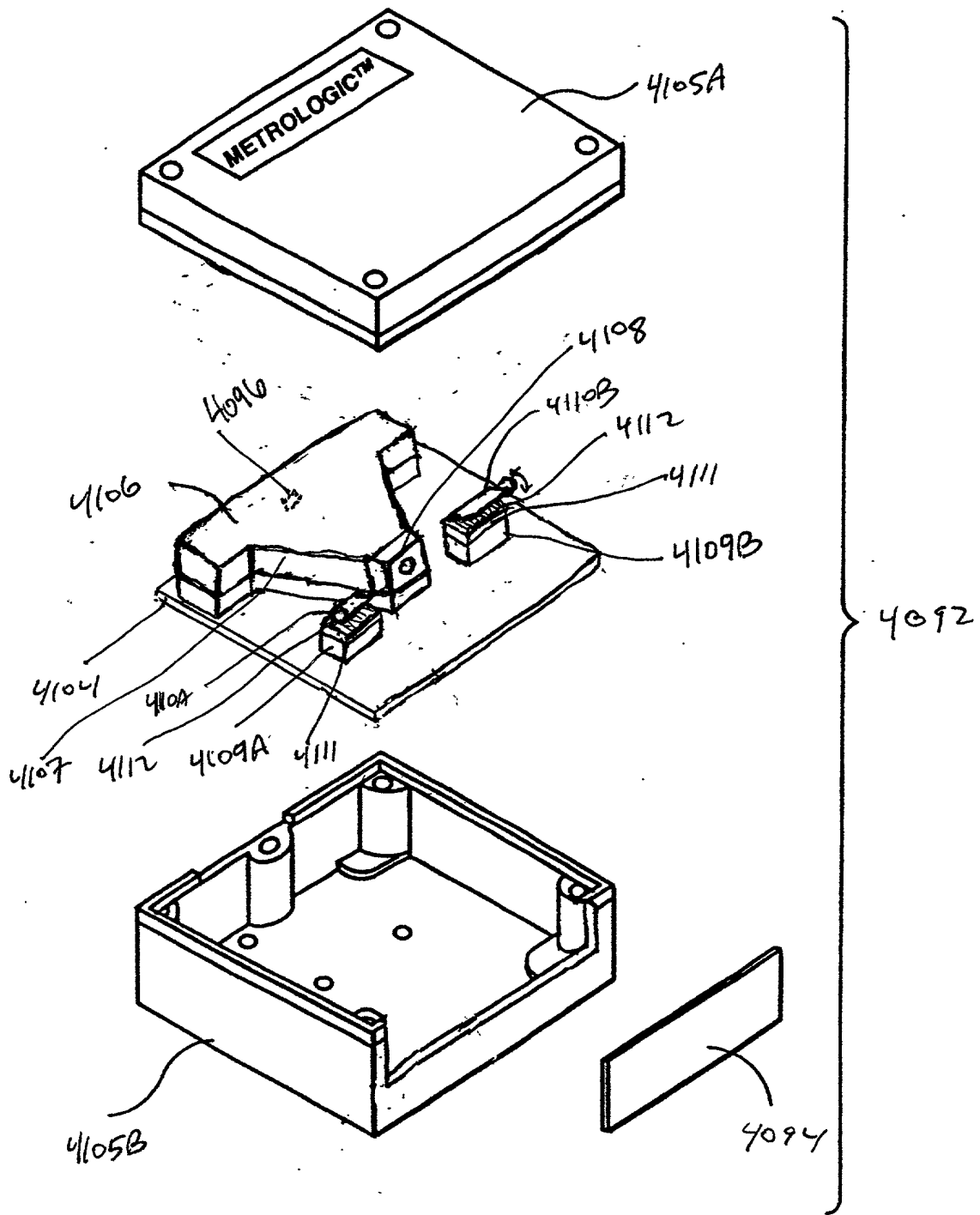


FIG. 55B

Brogg cell
Fig 126A-6B

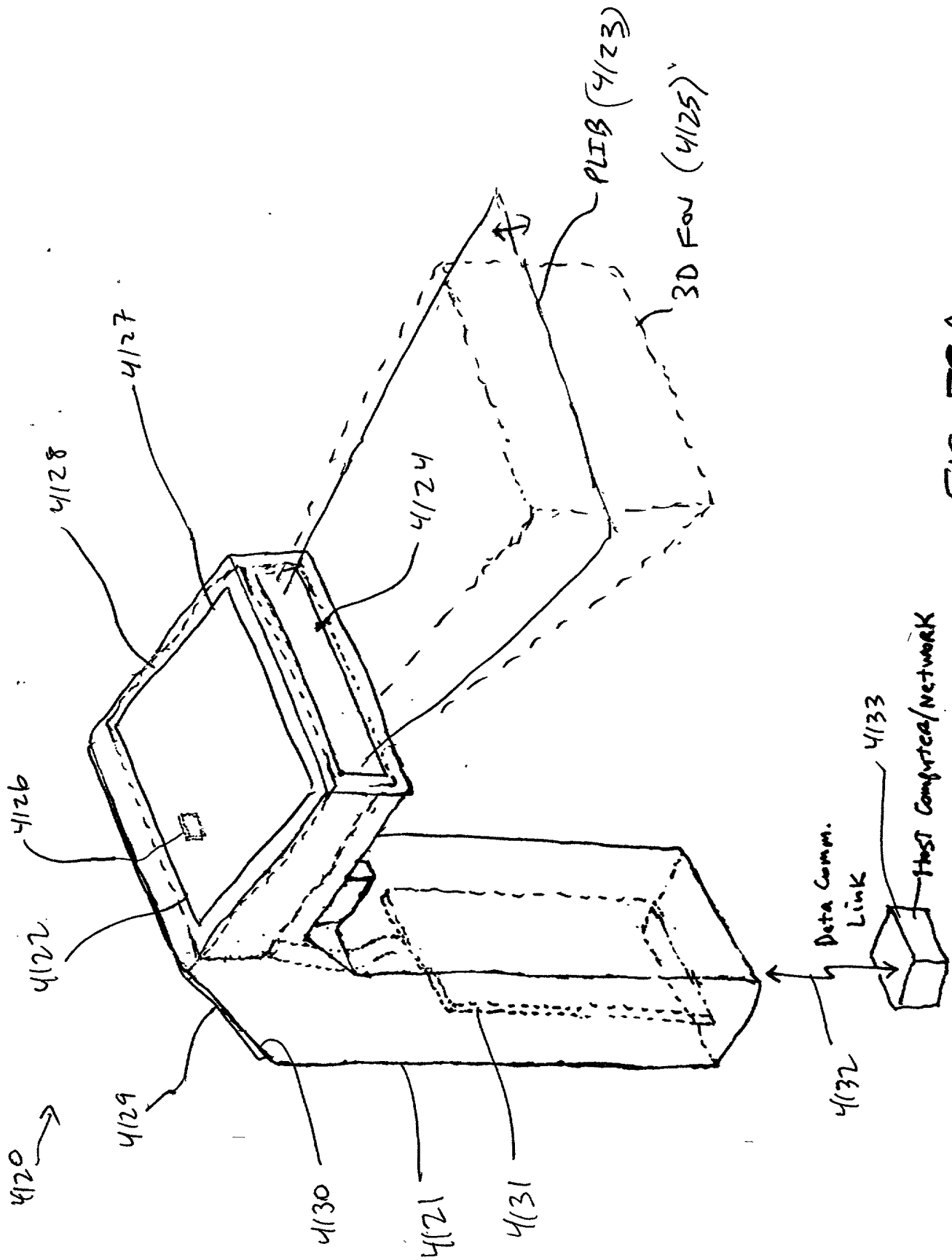


FIG. 56A

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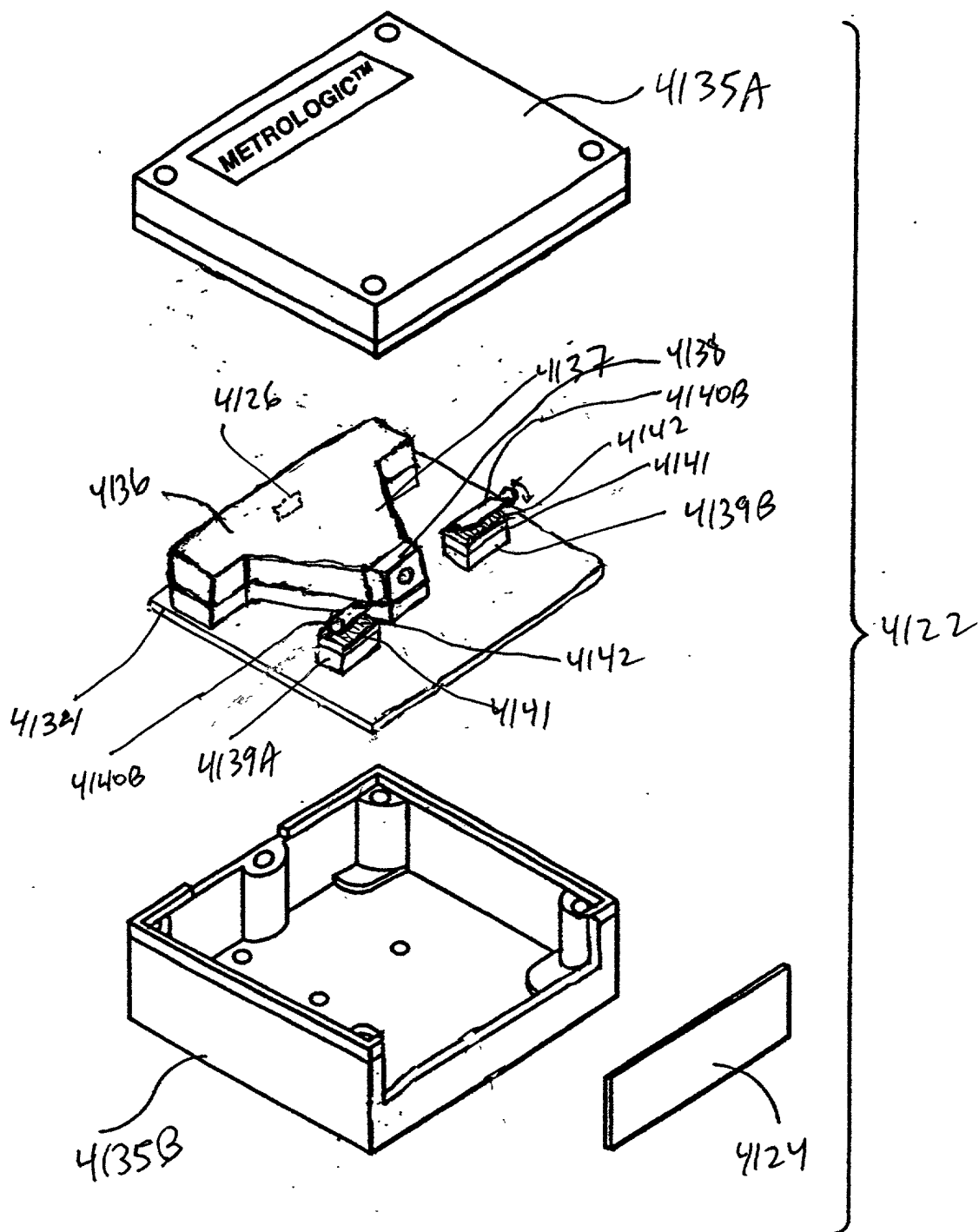


FIG. 56B

DM

Fig. 7A-7C

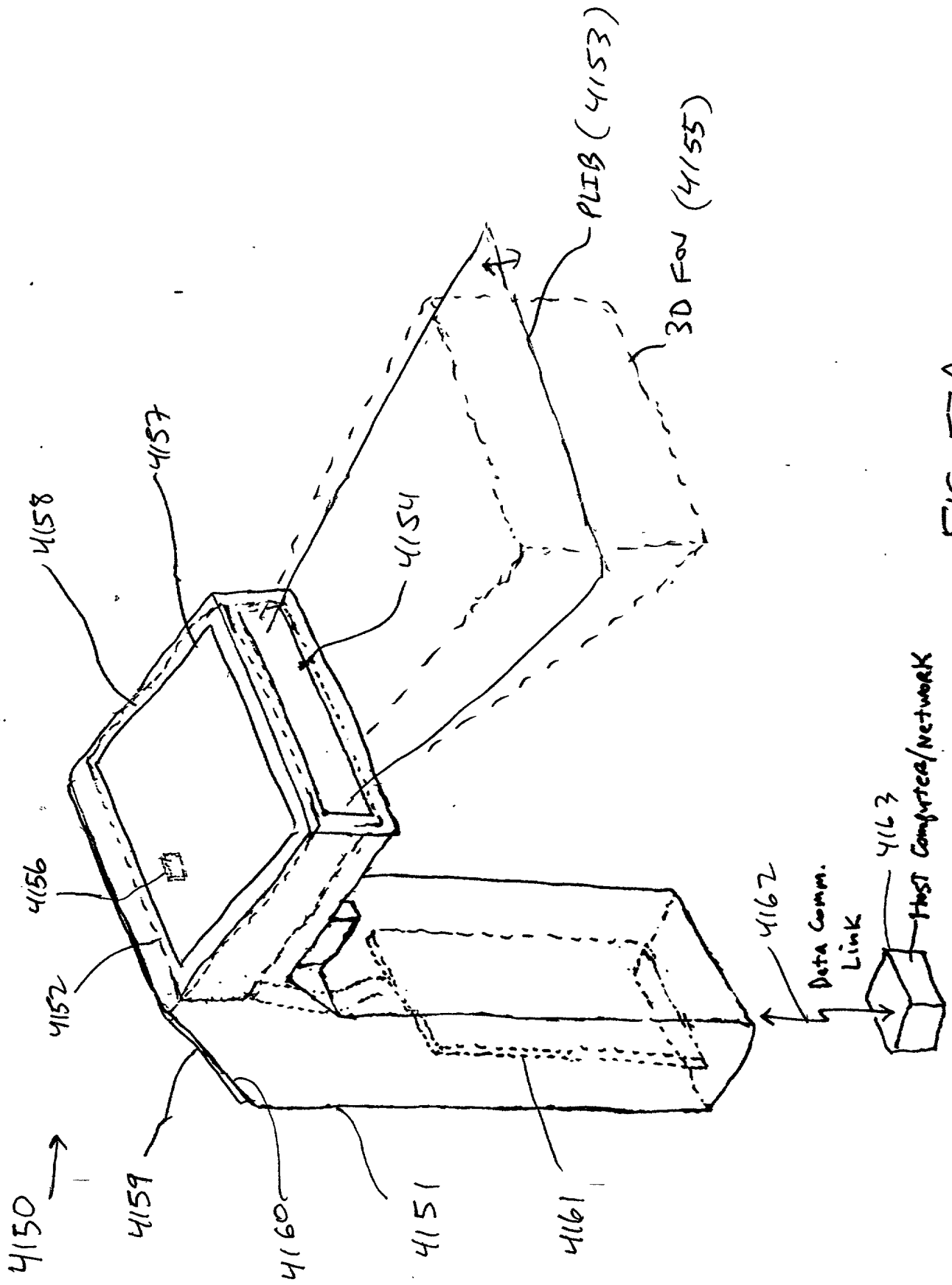


FIG. 57A

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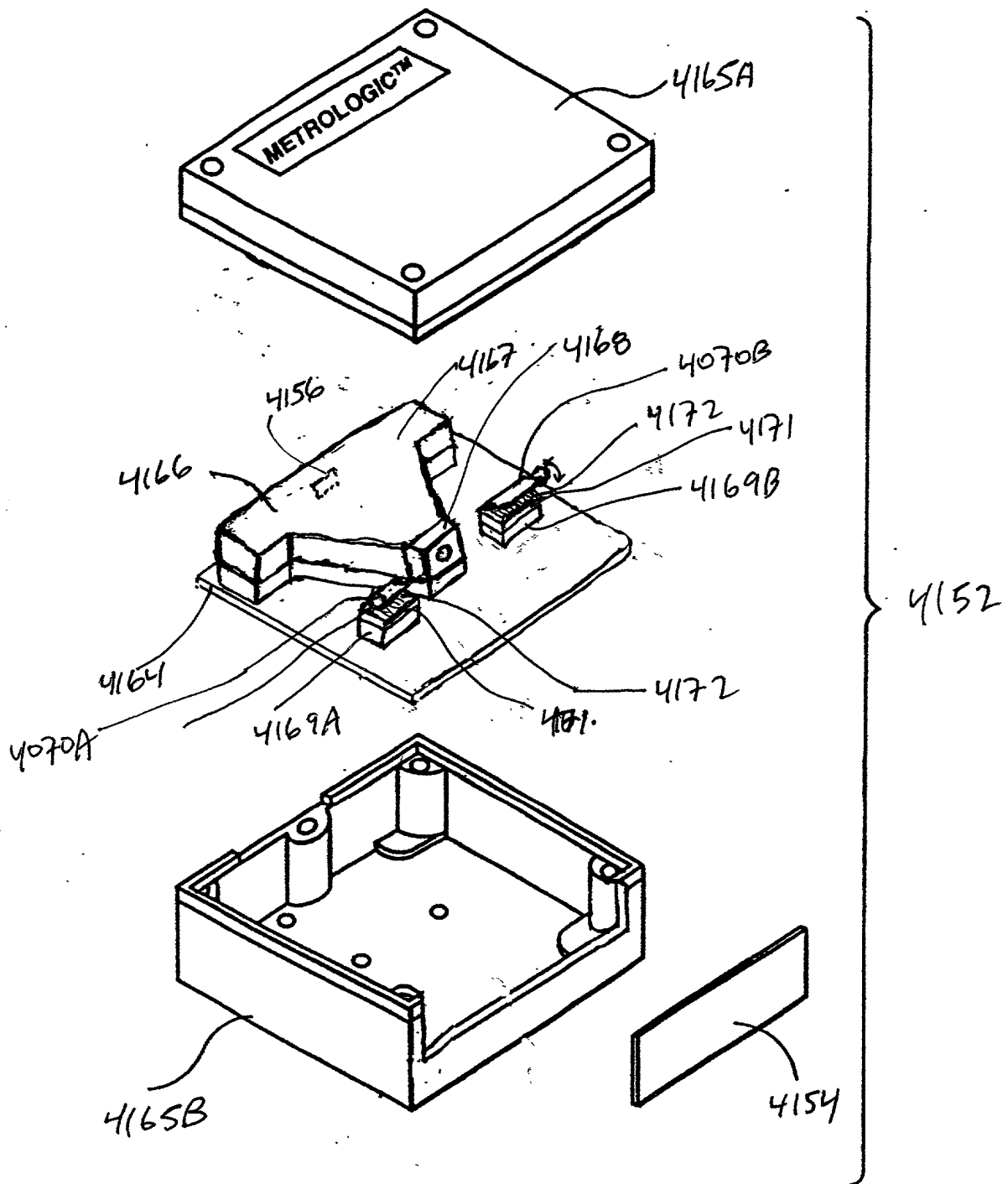


FIG. 57B

Phase only LCR
PM panel

Fys 1F8F-86

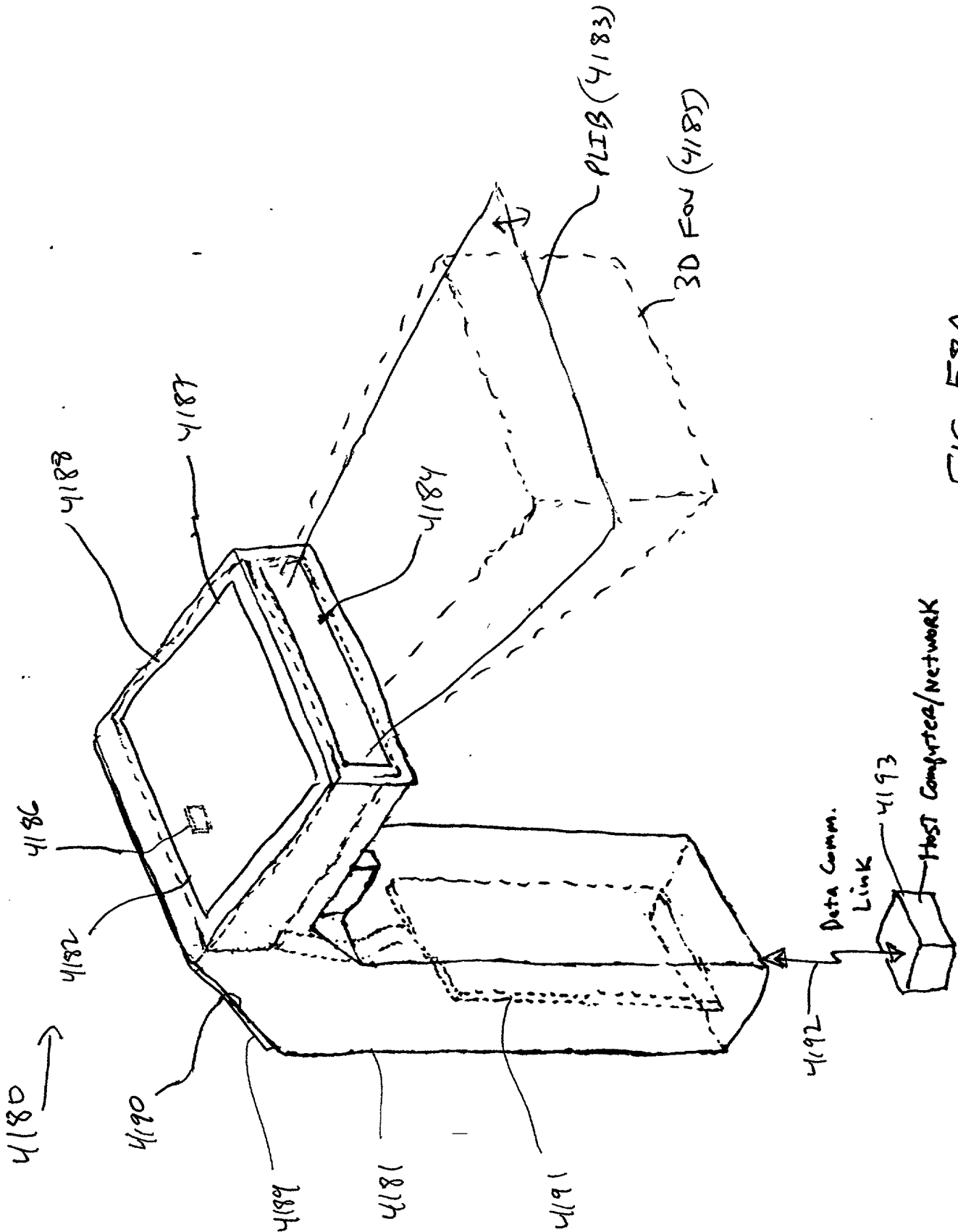


FIG. 58A

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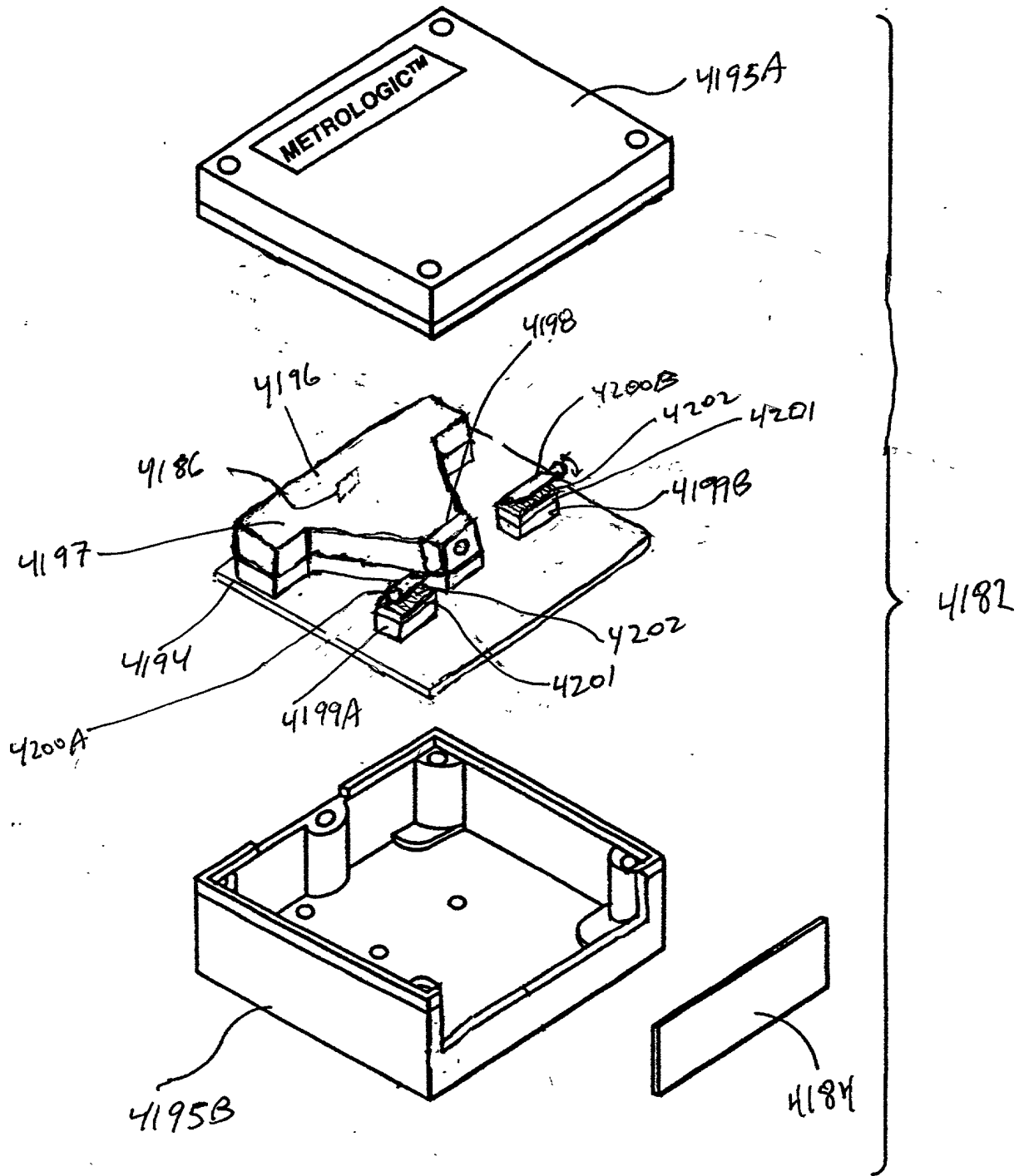


FIG. 58B

115 optical shutter

Fig. 1F14A-14B -

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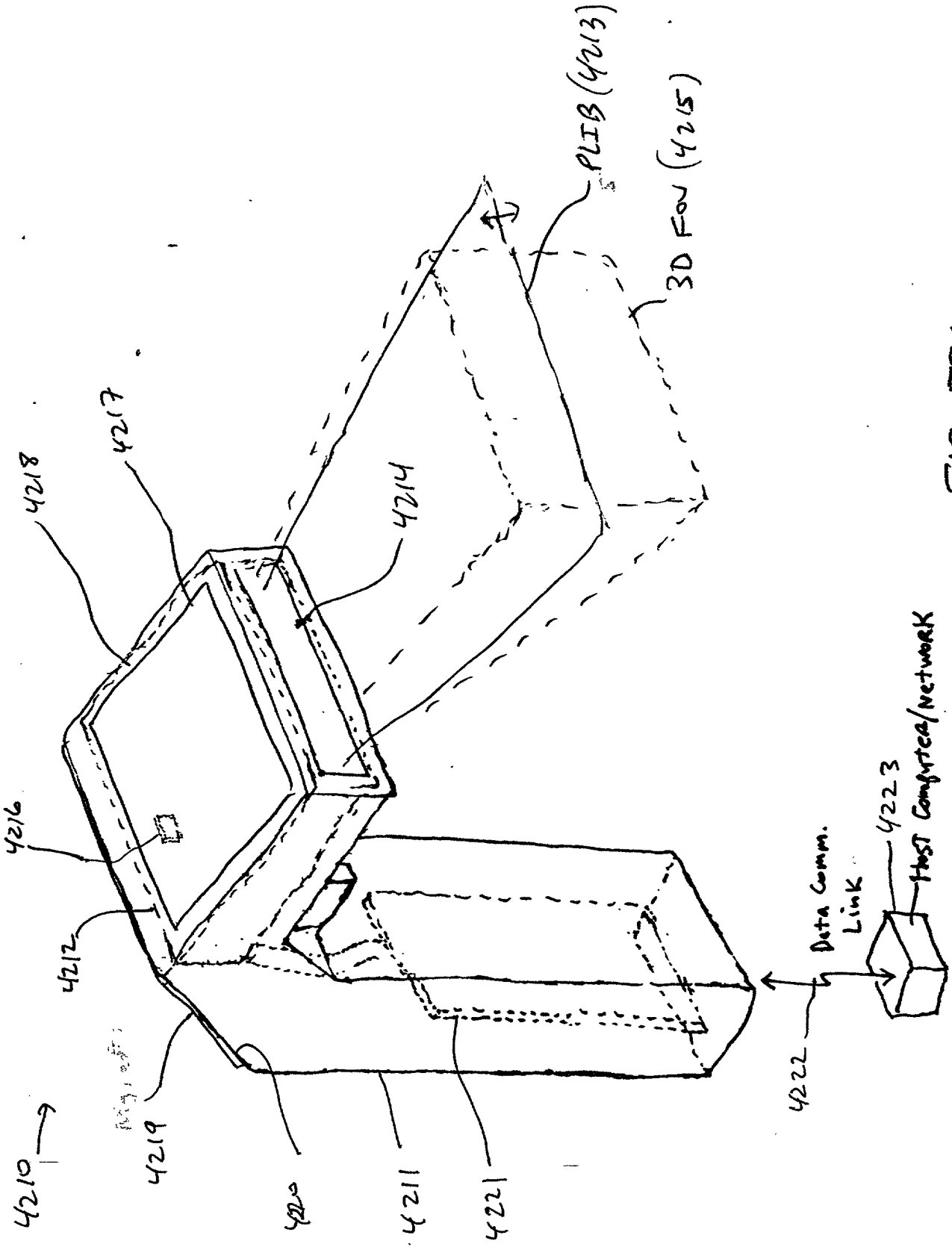


FIG. 59A

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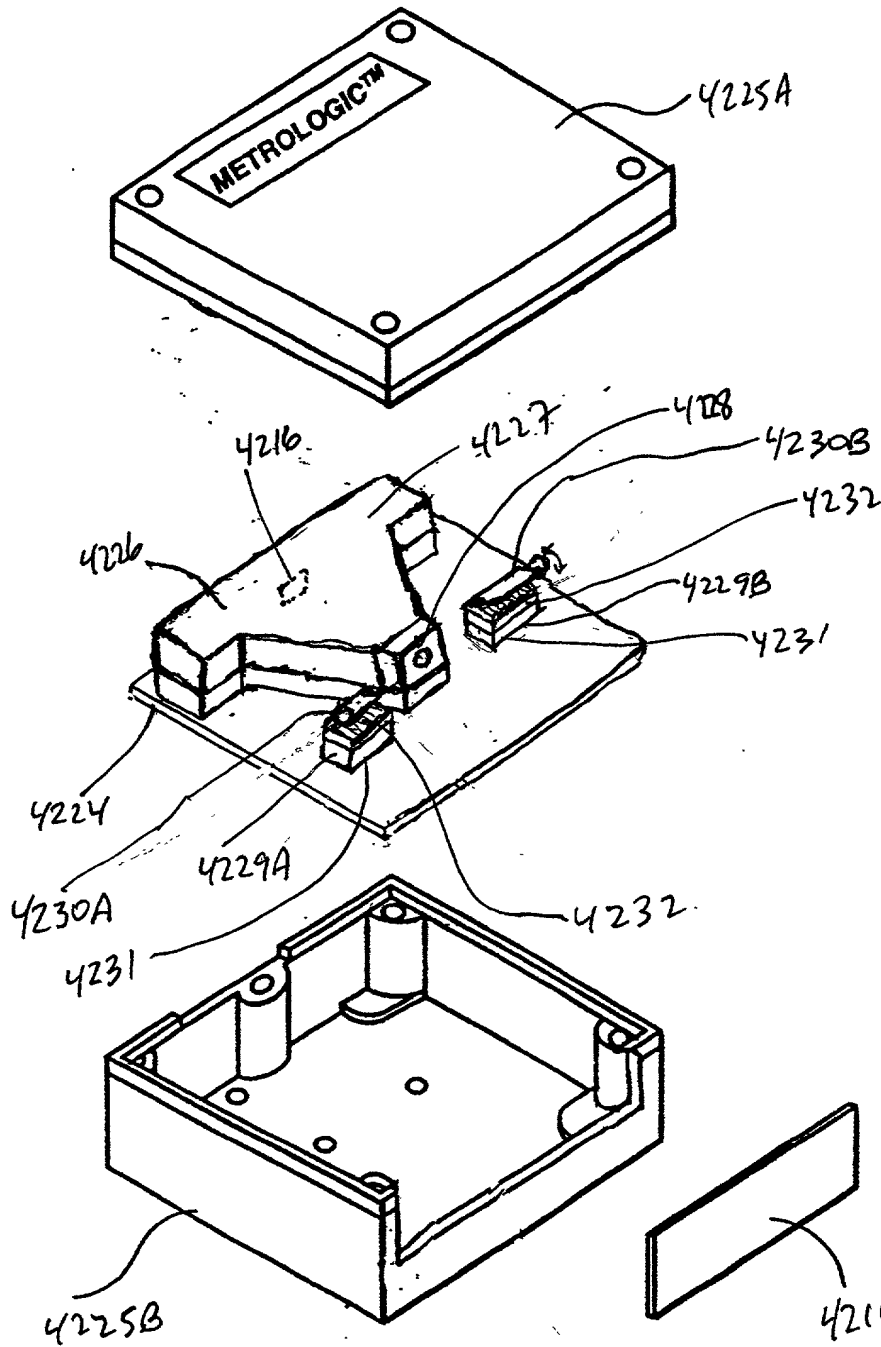


FIG. 59B

MLL

Fig. 15A-15B

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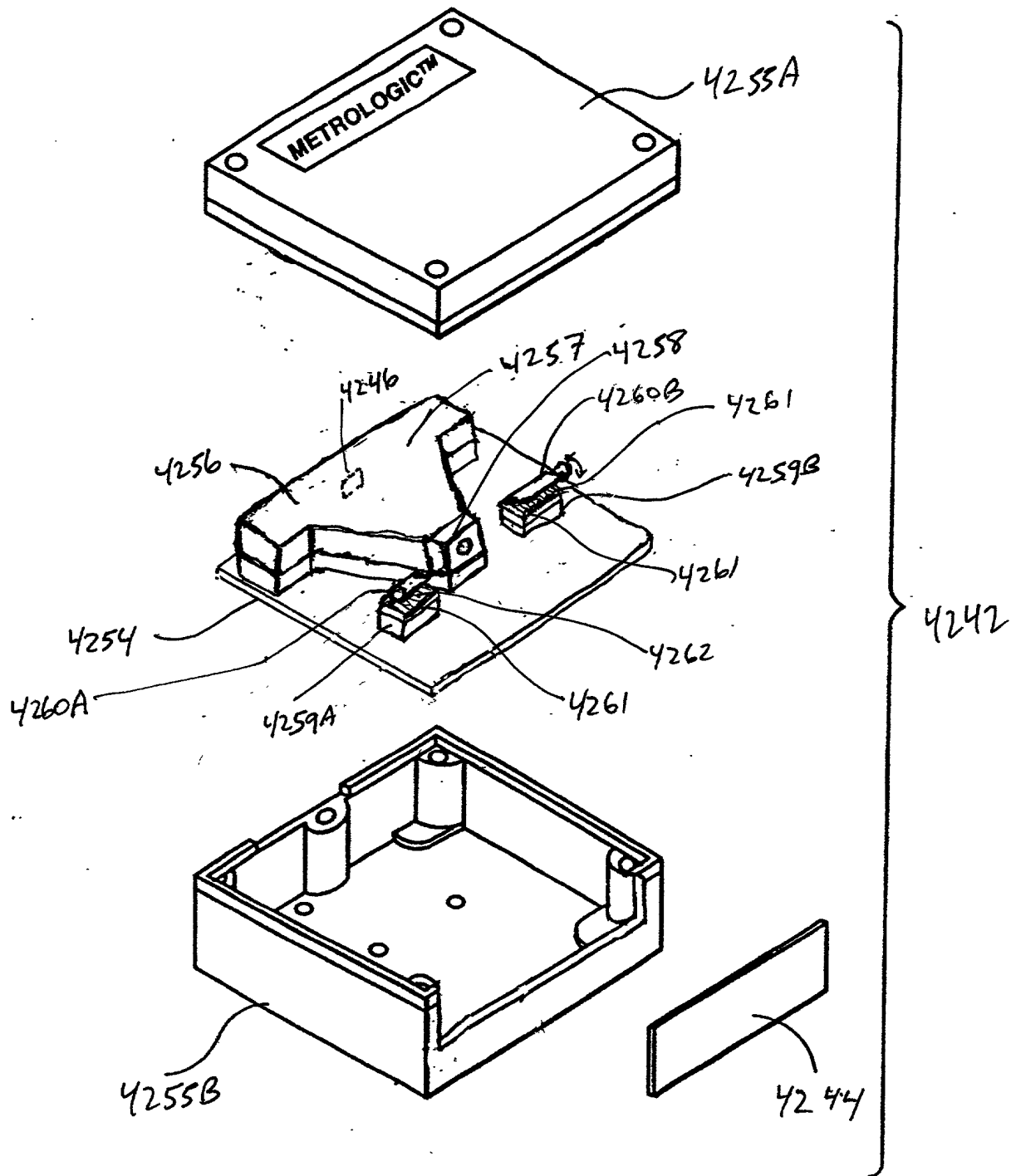
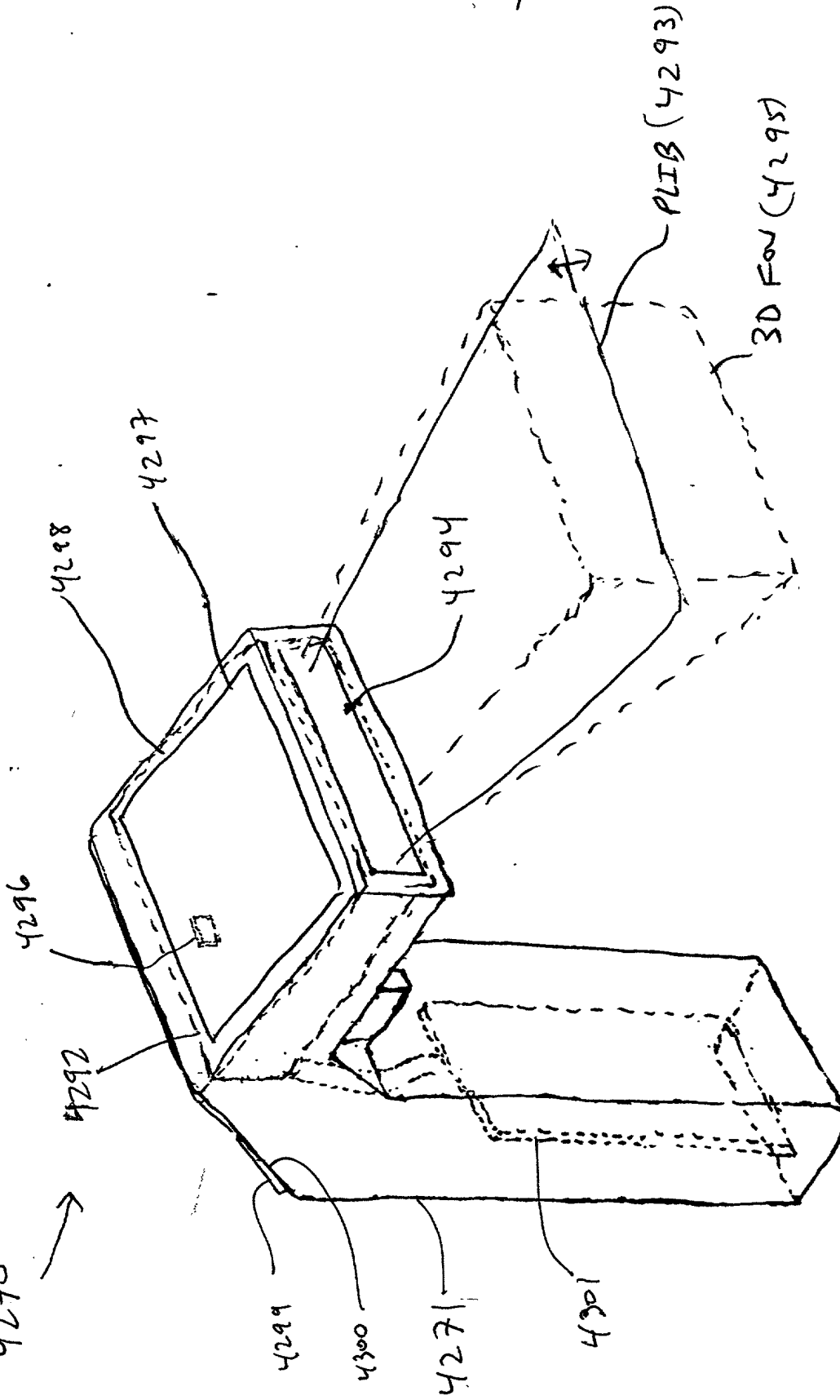


FIG. 60B

Bthalon (Tang. phase mod.)
Fig. 1 I 7A-17B

4270



4302 Data Comm. Link

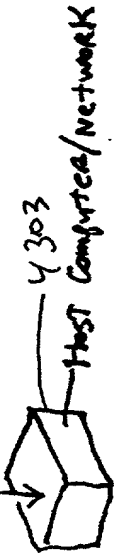


FIG. 6/A

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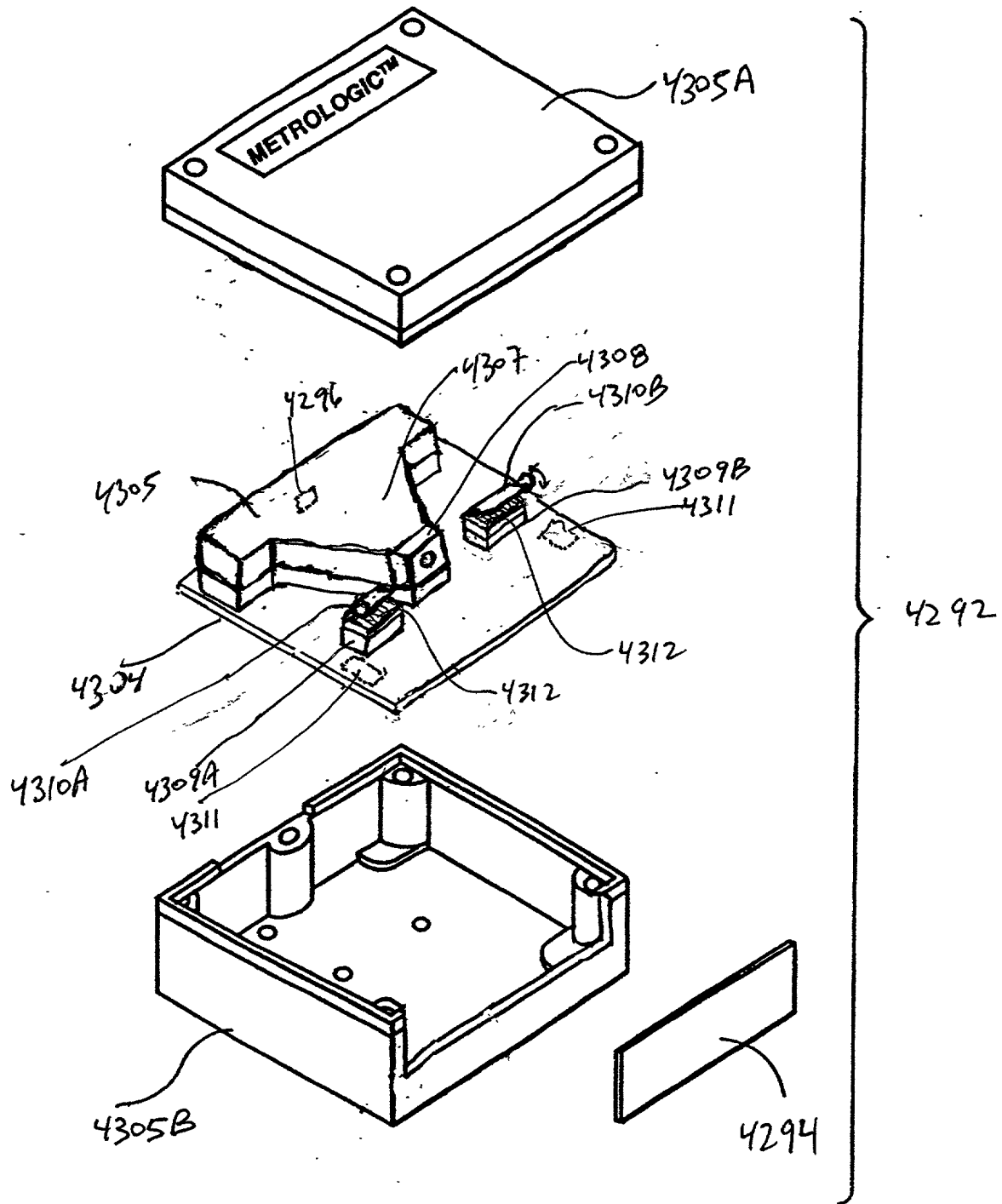


FIG. 61B

mod. hopping

Fig. 1A-19B

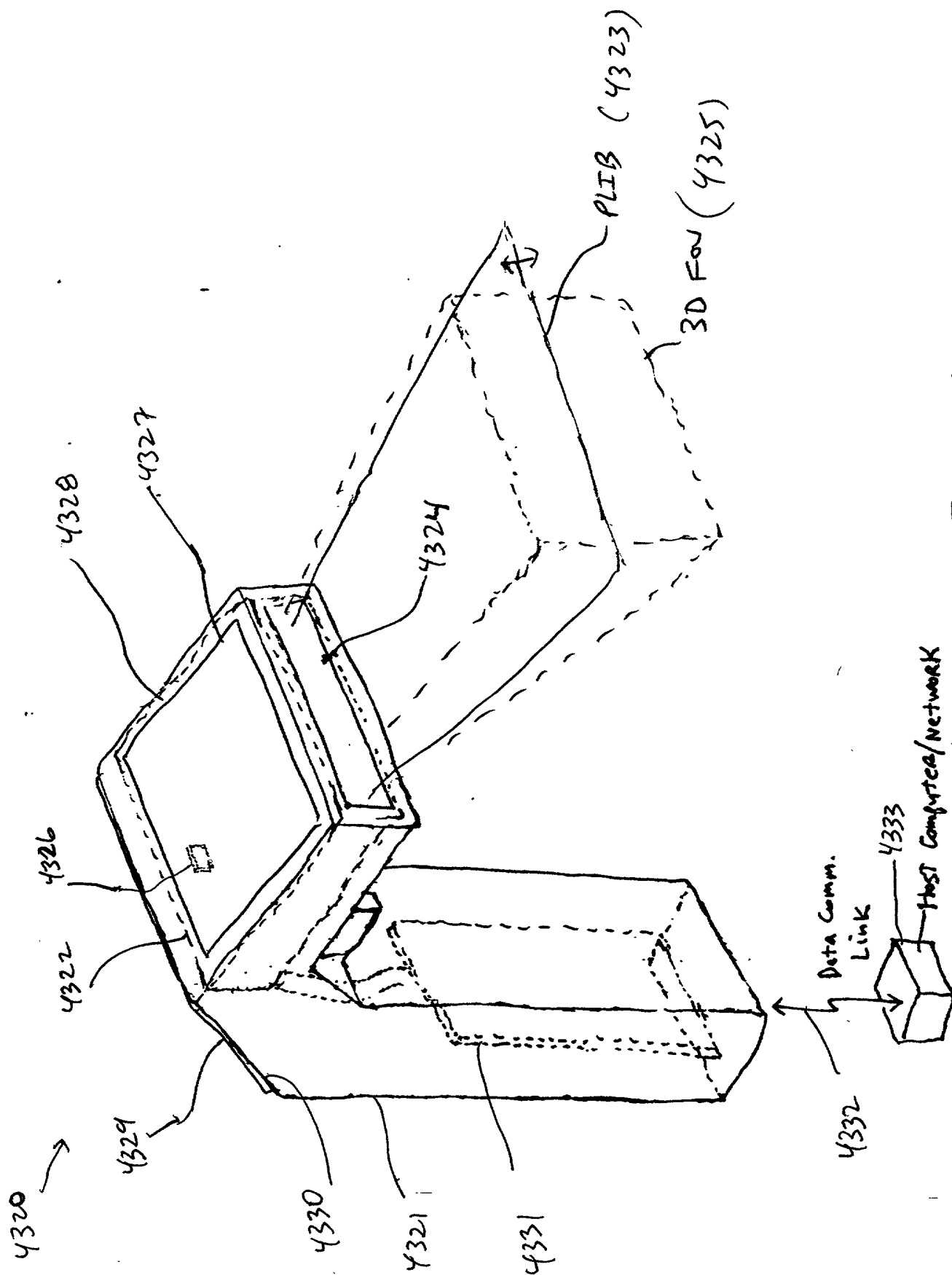


FIG. 62A

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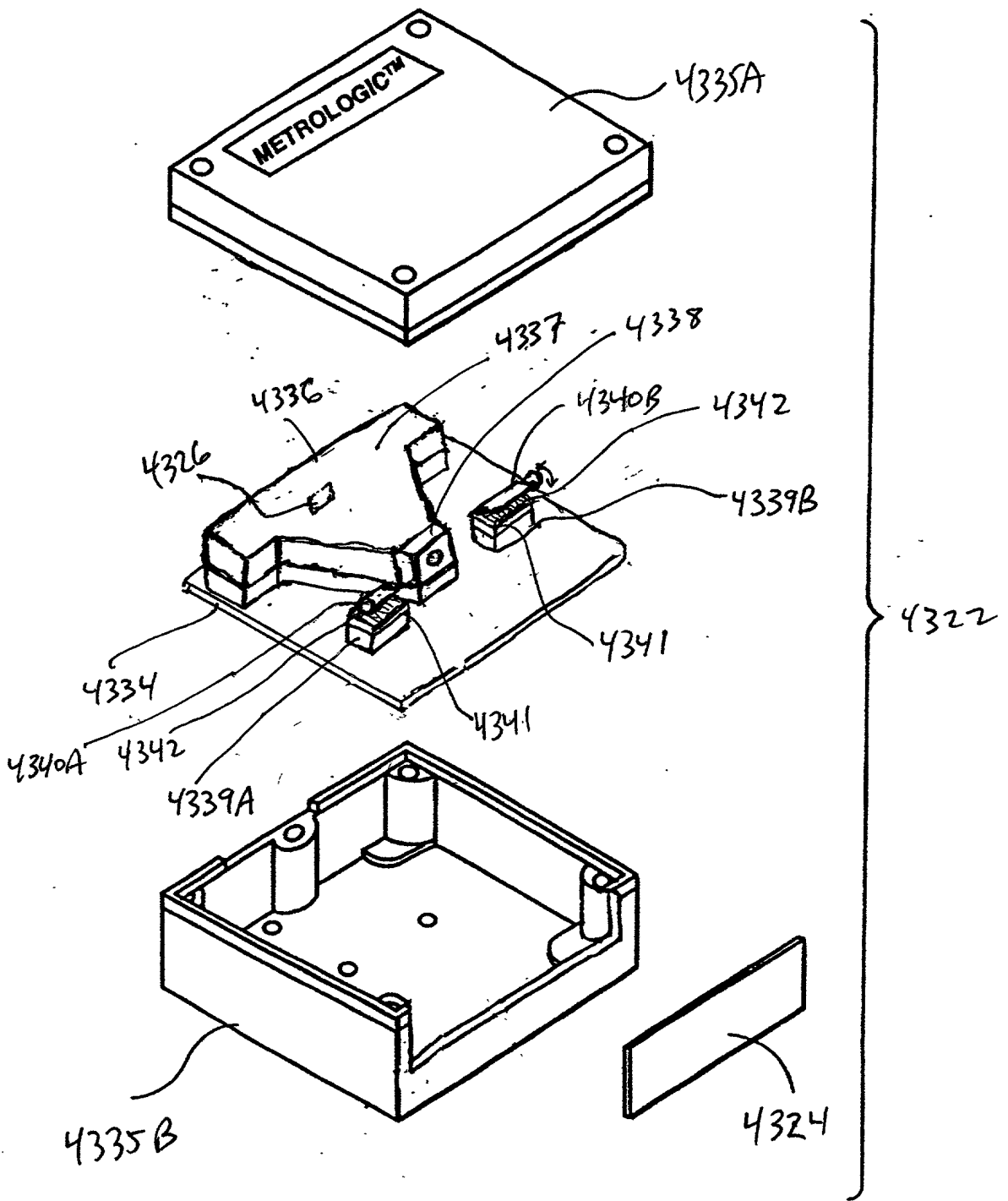
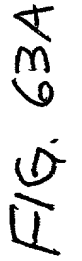


FIG. 62B

measoscillim
 Spatim intensity
 Mod. panels

Fig. 1F21A-21D

10067440-10040



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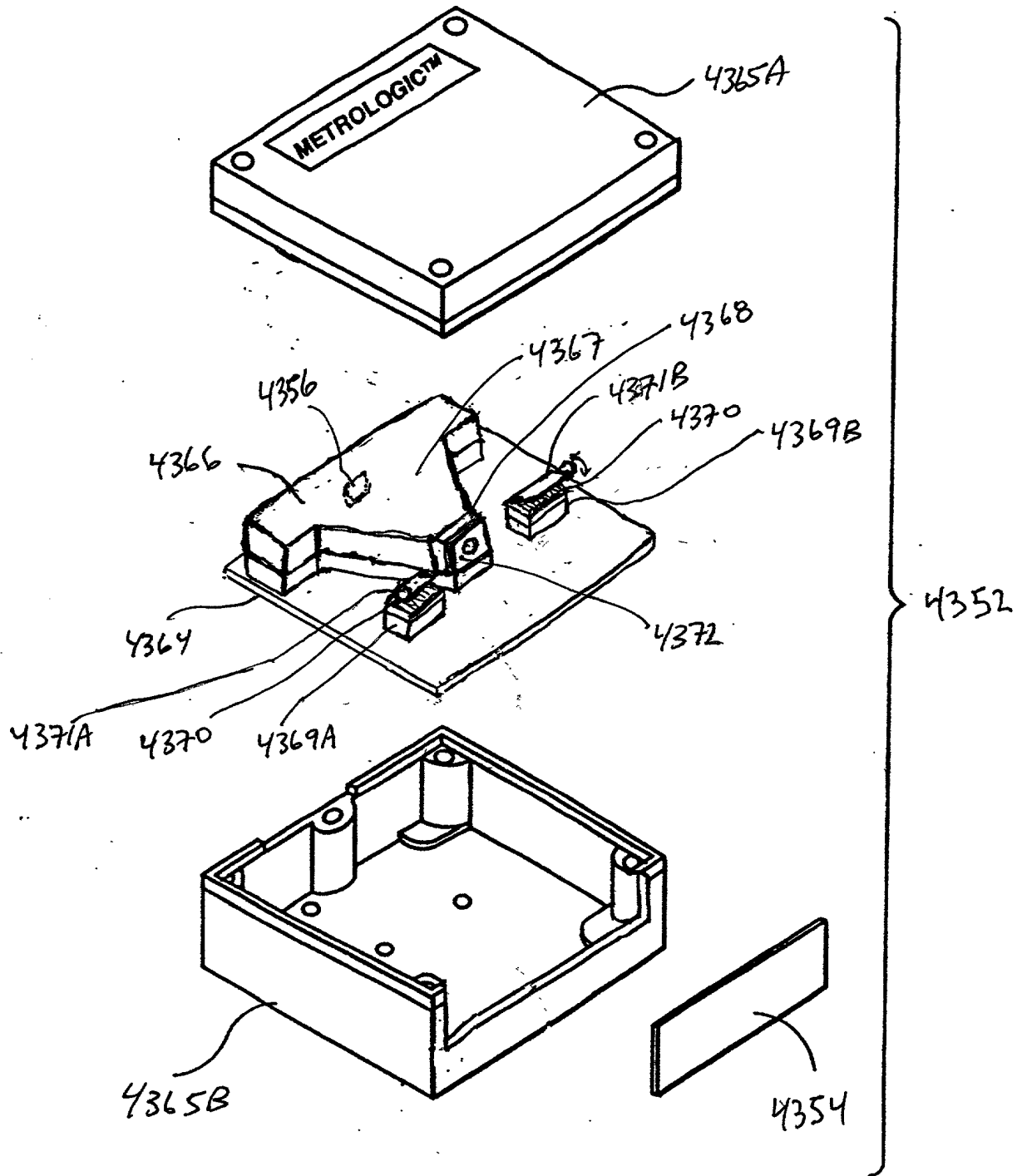


FIG. 63B

ED of
mechanical part of Iris

Fig 1^{IF}
23A - 23B

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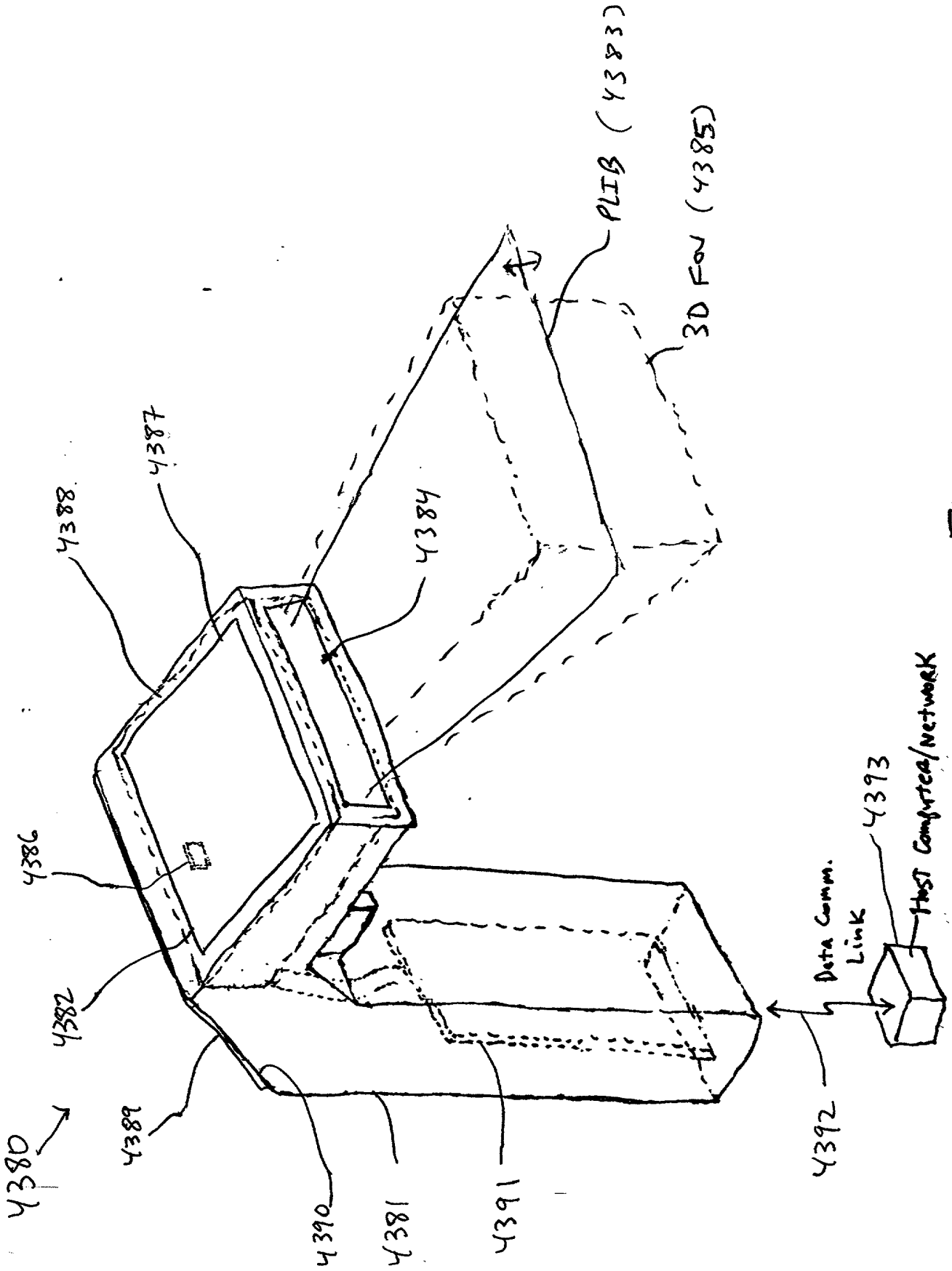


FIG. 64A

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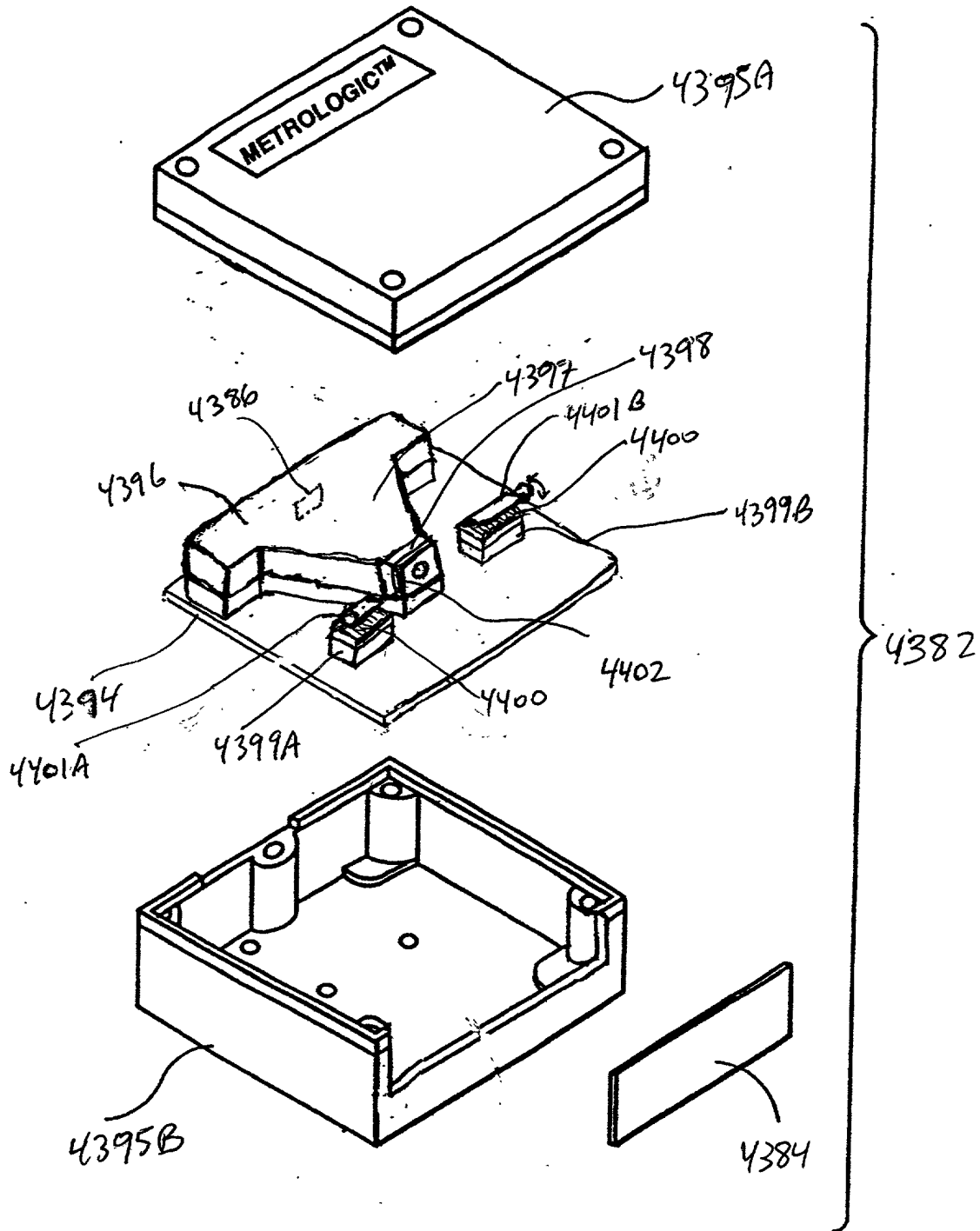


FIG. 64B

* E-optical
Shutter Before
EP Lens
Fig. 1E24A

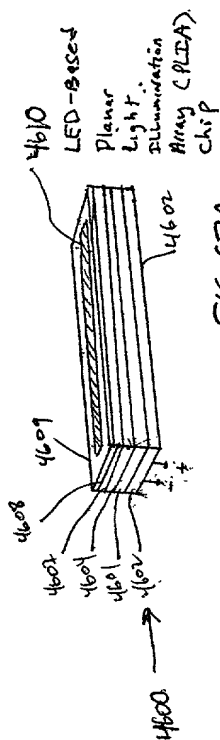


FIG. 67A

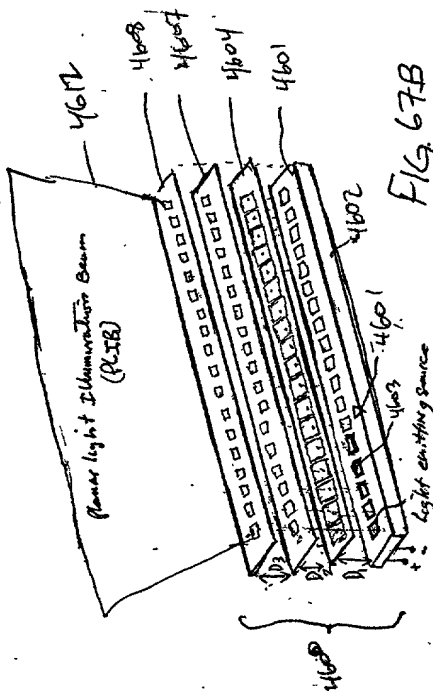


FIG. 67B

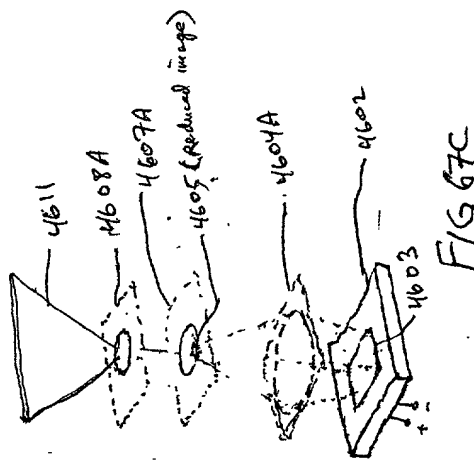


FIG. 67C

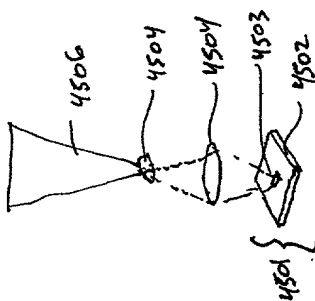


FIG. 65B

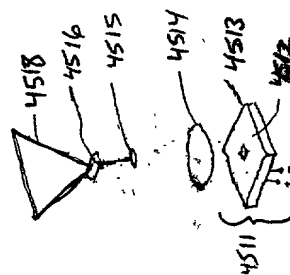


FIG. 66B

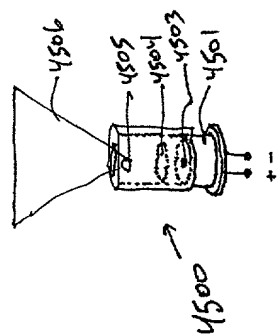


FIG. 65A

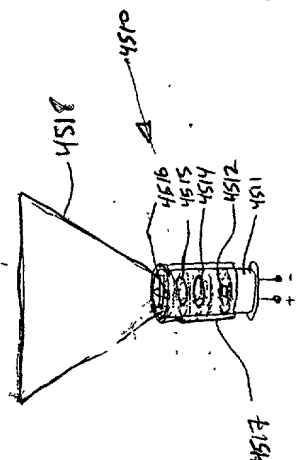


FIG. 66A

Baggage check-in Station #1

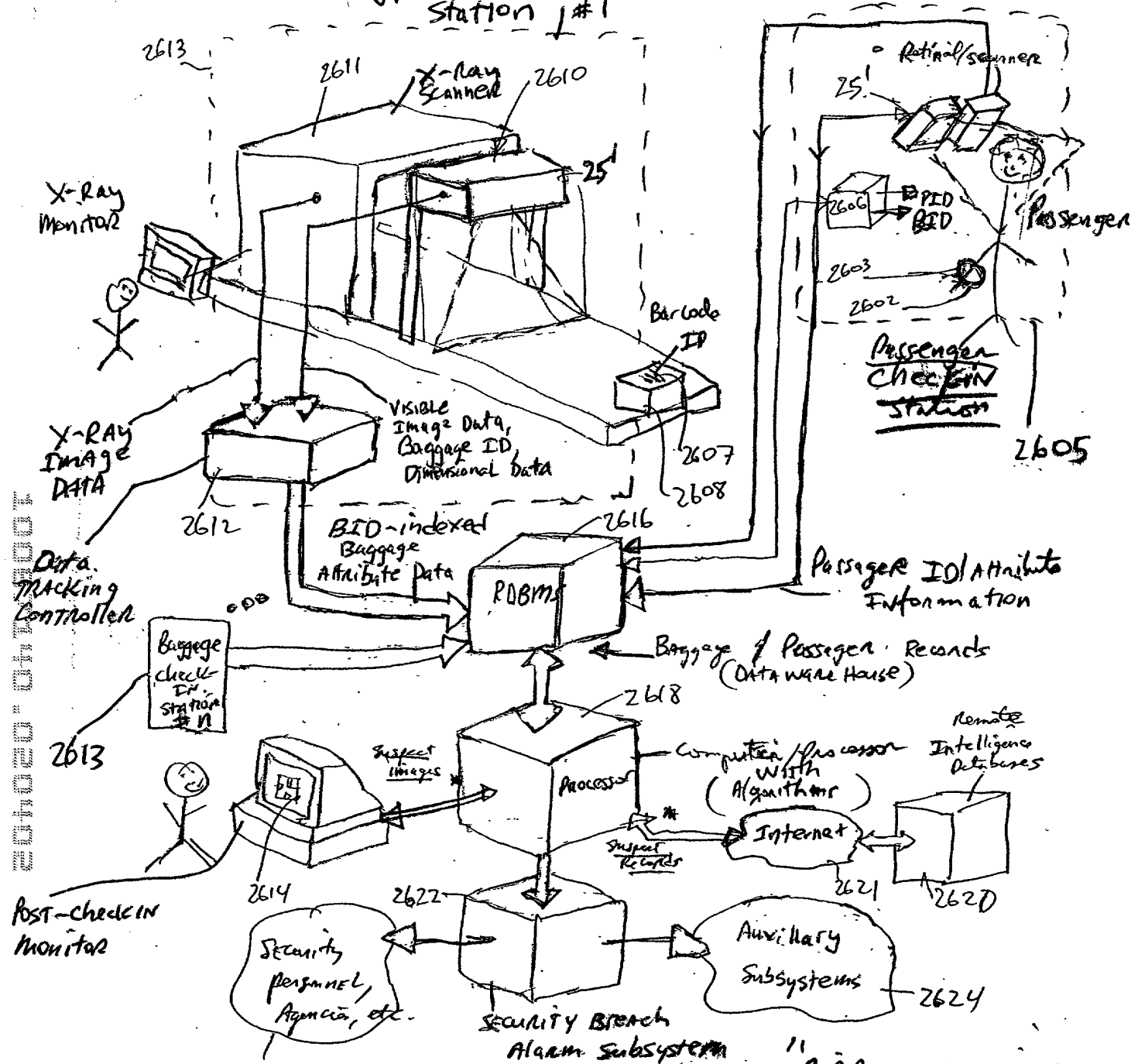


FIG. 68A

Attribute data 2621

RDBMS Record X

Passenger ID #	1	2	3	...	2620
Baggage ID #	1	2	3	...	2622
Baggage ID #	1	2	3	...	2622

FIG. 68B